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STEEL

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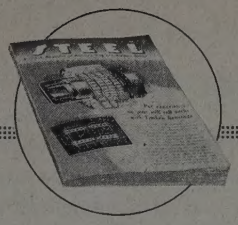


January 13, 1947

Water Over the Dam

If one is looking for an easy way to judge how much water has gone over the dam during the past year he can do it by comparing President Truman's state-of-the-nation message of last Monday with his combined state-of-the-nation and budget message presented to Congress last January.

The two are as far apart as the poles. A year ago the President, who immediately after V-J Day had favored taking the government out of its "mother knows best" role, reversed himself in these ominous words: "There is no question in my mind that the government, acting on behalf of all the people, must assume the ultimate responsibility for the economic health of the nation. There is no other agency that can. No other organization has the scope or the authority, nor is any other agency accountable to all the people."

The implications of this pronouncement were accentuated by the "must" legislation that the President proposed, much of which had as its purpose a continuation and extension of wartime controls. To sum it up in a nutshell, Mr. Truman last January was resigned to the left-wing New Deal policy of perpetuating a wartime political dictatorship.

Fortunately much of that which Mr. Truman sponsored in early 1946 was diluted by Congress or proved absurd by events of the past year. Last Monday when he addressed the 80th Congress, he talked more as an executive on his own and less as a spokesman for the backseat drivers of a former regime.

He spoke with pride of the fact many wartime controls had been abandoned. He assigned responsibilities to industry and labor. "It is up to industry not only to hold the line on existing prices, but to make reductions wherever profits justify such action. It is up to labor to refrain from pressing for unjustified wage increases that will force increases in the price level." He mentioned abuses of power by unions which should be prohibited.

It was refreshing to hear that labor and management have responsibilities, because a year ago the responsibility for everything was assumed by Washington. It was heartening to hear that a President of the nation will admit that a union can be guilty of misconduct. It was stimulating to hear a President say with convincing graciousness that Congress shares with the Chief Executive "the power to mold the future."

Yes, lots of water has flowed over the dam since a year ago!

* * *

CONFUSION IN PRICES: During the last 30 days significant changes have taken place in the pricing of steel. There has been an increasing tendency to quote on basing points nearer mills. Base prices of most products have been increased moderately. Extra lists have been revised drastically and in some instances the changes result in prices that look formidable to steel buyers.

The sudden impact of these changes, following a prolonged period of static prices, has thrown buyers and sellers into a temporary state of mild confusion. Numerous questions are arising as to interpretation of the new extra cards. Consumers report that there are wide variations among sellers as to the manner in which they apply extras. It is safe to say that today the pricing of steel is on a more independent basis than at any time in decades.

Obviously the new pricing system will be subjected to a shaking down operation. Revisions to correct inequalities may be expected. Consumers seeking to cut costs will modify some specifications

(OVER)

and in that process the need for certain extras may be minimized or eliminated.

Steel pricing now is in the process of being applied to conditions of supply and demand and of costs that are far different from those obtaining before the war. Experience may indicate that these changes are of such magnitude as to require new techniques in pricing. —p. 55

• • •

POWERFUL INCENTIVE: Speaking at the banquet of the Society of Automotive Engineers in Detroit last Wednesday evening, Secretary of Commerce W. Averell Harriman gave a realistic picture of how the people in the war torn countries of Europe and Asia regard the United States and its system of private enterprise.

"What people in those countries have heard about conditions in the United States during the past year," said Mr. Harriman, "has caused them to fear that our various readjustments will affect our ability to exert a useful influence in the development of world economy. They need a strong, stable U. S."

This is absolutely true. People all over the world look upon the United States as the hope of the postwar world. They feel that if our economy should plunge into another tailspin of acute depression, its repercussions would inflict almost unbearable hardships upon people all over the globe.

Realization of this fact should be an additional powerful incentive to Americans to work hard for economic stability at home. —p. 54

• • •

ON WAY TO STABILITY: Highlighting the 19th annual convention of the Institute of Scrap Iron & Steel Inc. was discussion by numerous speakers of the present situation in steelmaking scrap. Consensus of opinion was that in spite of spectacular gyrations in prices, the scrap market is on its way toward stabilized and normal trading conditions.

Institute President Edwin C. Barringer pointed out that less than two months have passed since government controls were lifted and declared that "60 days is too short a time in which to expect stability to be achieved after 6½ years of artificial suppression of normal laws of trading."

Walter Tower, president, American Iron & Steel Institute, emphasized the need for prompt correction of conditions arising from wartime distortions which have affected the scrap industry adversely.

General tone of the meeting was an eager desire to restore the scrap business to a basis of sound functioning as quickly as possible. —p. 52

SIGNS OF THE TIMES: Recognizing the cold truth that one cannot have his cake and eat it too, the Monnet four-year plan for industrial recovery in France (p. 62) stipulates that the nation revert to the 48-hour work week, in place of the 40-hour week now legally in effect. . . . "The Postwar Corporation Tax Structure," 80-page mimeographed report prepared by Richard Goode of the Treasury's Division of Tax Research, finds merit in a single tax system that would eliminate the double taxing of corporation earnings. Under this plan the individual would pay taxes on dividends received and the corporation would pay taxes only on undistributed earnings. The report (p. 58), which makes no recommendations, will make interesting reading for industrial executives. . . . A new automatic boring and turning mill having a special chucking arrangement bores the center hole of a rolled steel car wheel (p. 115) simultaneously with the machining of the rim, flange and tread at the rate of six wheels per hour. . . . Steel output in Great Britain in November was at an annual rate of 13,715,000 tons (p. 63)—the highest rate ever recorded in war or in peace. The achievement is remarkable in view of present shortages in fuel and labor and difficulties in transport. . . . Automotive & Aviation Parts Manufacturers Inc. figures that the material requirements for 1947 production of automobiles and trucks, together with replacement parts (p. 65), may be about 18.5 per cent higher than in 1946 or 40 per cent higher than in 1941. This estimate is based on the assumption that 5,000,000 cars and trucks will be built during the year. . . . Instrument Society of America, while recognizing that surface finish instrumentation already has contributed much to the science of interchangeable manufacture, believes that it can contribute more in the future. It looks forward to the day when surface finish control (p. 82) will be as universally practiced as the use of dimension control is today. . . . American Iron & Steel Institute is advocating reduction in the tariffs on certain raw materials (p. 56) imported from abroad for consumption by the iron and steel industry. . . . A steel company ceramic engineer calls attention to the fact that lack of close control on the size of fire brick intended for straight flue checker chambers for open-hearth regenerative systems (p. 110) is a matter of concern to steelmakers.

E. L. Shaner

EDITOR-IN-CHIEF

STEEL
January 13 1947

Steel Wage Settlement May Set Industry Pattern

Dr. Ralph Robey, chief economist for the National Association of Manufacturers, points out some of the fallacies in the much-publicized Nathan report at a luncheon for newspapermen in Washington. NEA photo

Prospects for agreement on new contract without work stoppage favorable. Discussions between United States Steel subsidiaries and steelworkers' union to start Thursday in Pittsburgh. Nathan report assailed by manufacturers' economists

WAGE negotiations which may have a profound influence on the course of production and prices in 1947 will start this week at Pittsburgh. Representatives of the five steel producing subsidiaries of the United States Steel Corp. and of the United Steelworkers of America-CIO will sit down at 10:30 a.m. Jan. 16 to discuss the union's demand for a "substantial" wage increase and other concessions.

Upon the outcome of these discussions may depend whether this year is to be one of high production and controlled prices, or whether it will be a year of industrial strife with resultant losses in output, scarcities of materials and goods, and wildly fluctuating prices. A fair and peaceful settlement between Big Steel and the union might well indicate a pattern for other wage negotiations to follow—not only in steel but in all the metalworking industries.

Many factors auguring for a peaceful settlement can be discerned.

Both industry and labor are anxious to avoid a work stoppage. Both have much to lose and little to gain through further strikes.

The union is expected to act with more restraint than it did in 1946. Members definitely do not want to strike. The memory of their profitless pay increase of a year ago, when they won an additional 3½ cents an hour increase after a month-long strike, is still vivid.

Union leaders are aware that the negotiations will be watched closely by Congress, already angered by the fall coal strike. They realize that any high-handed tactics by the union will hasten passage of restrictive legislation that may eliminate many of labor's gains. On the other hand, they hope that attainment of an amicable settlement through the free collective bargaining process may assuage the resentment of Congress and the public over the 1946 strike record and that the labor legislation adopted may be tempered.

Top union officials have been careful to avoid talk of strikes. In announcing that strike notices would be filed in compliance with the Smith-Connally Act, union leaders stressed that this was only a precautionary routine and indicated no intention of calling a walkout.

These will be the first major wage negotiations to be conducted for several years under free collective bargaining. Management and labor will be the parties of the first and second parts and the government will be conspicuous by its absence. Settlement will be hampered by no wage or price controls.

Under these circumstances, the union is expected to lean heavily on persuasion as its principal weapon. It will argue that rising living costs necessitate a wage increase and that the profit probabilities make an increase feasible. Much of its argument will be based on figures contained in the Nathan report, made for the CIO by Robert R. Nathan, former government economist. The Nathan report contended that "total corporate business

can support a 25 per cent increase in wages . . . without any further increases in productivity, without further expansion in volume, and without reducing the return after taxes on net worth to a rate below that of 1936-39." Nathan also is preparing a separate report dealing specifically with the steel industry's ability to pay a wage increase.

The Nathan report has been roundly attacked by other economists since its release last month. It has been labeled "statistical nonsense" by the National Association of Manufacturers through Dr. Ralph Robey, chief economist for the association.

Refuting the Nathan conclusions at a recent luncheon in Washington, Dr. Robey declared Mr. Nathan's findings were based in misrepresentation of statistics on profits, wages and prices and the substitution of estimates for facts.

Dr. Robey assailed Nathan's record as a "guesser" by pointing to the latter's estimate in August, 1945, when he was deputy director of reconversion, that "unemployment would rise to 5 million or more within three months; perhaps to 8 million before next spring."

Since maximum unemployment was 2,700,000, Dr. Robey points out that Nathan's error was almost 200 per cent.

Another Error Cited

At the end of October, 1945, the Office of War Mobilization & Reconversion predicted "the total decline in salaries and wages in 1946 will amount to between $30 and $35 billion." Actually, says Dr. Robey, "the decline has been only $5 billion so Nathan was wrong by a minimum of 500 per cent."

Concluding that Nathan's record as a "guesser is not such as to inspire confidence," Dr. Robey continues to point out that many of the figures in the Nathan report are merely his own estimates and conjectures.

Nathan's contention that general wage increases are justifiable on the grounds of reduced real wages was assailed by Dr. Robey who pointed out that his adversary selected January, 1945, the peak of the war period as a starting point and on this basis showed that the wage index is now 96.5 while the price index is 116.8.

If Nathan had used 1939 as a starting point, the wage index would be 192 and the price index 149, Dr. Robey pointed out, and submitted Bureau of Labor Statistics figures to substantiate his argument (See accompanying table).

"A comparison of present wages and prices with wages and prices prevailing in 1939 is much more to the point than the comparison made by Nathan with a month when the war was in full swing. This comparison has already been made. Since 1939, consumer prices have increased only 49 per cent, while the average weekly earnings have increased 92 per cent, and average hourly wages have increased 79 per cent. It does not look as though workers in manufacturing have fared as badly as Mr. Nathan would have us believe."

Dr. Emerson P. Schmidt, director of the economic research department, Chamber of Commerce of the United States, also has exposed many fallacies in the Nathan report.

Dr. Schmidt points out that the CIO-paid economist has ignored the fact that during the war the rise in wage rates was almost twice as great as the increase in living costs and starts his figuring January, 1945, when wages were already inflated by the war.

Admitting that prices have struggled to regain a balance with wages since the end of the war, Dr. Schmidt also reminds that the profit dollar as well as the wage dollar has suffered a reduction in its buying power.

Neither Dr. Schmidt nor Dr. Robey can see the fairness of using 1936-39 as a base period for figuring profits and January, 1945, as a base for tracing the relationship of wages and prices.

Dr. Schmidt warns that a second round of wage increases would mean further increases in prices.

"In every line of business there are always marginal producers, those just breaking even or operating at a loss. A wage increase demanded by industry-wide unions will inevitably affect these high-cost producers just about the same as the low-cost producers. The 18½-cent hourly raise of last winter in numerous industries was forced on all producers in those industries and raised prices. If the high-cost producers are going to stay in business, they must raise their prices when their costs rise. The more efficient producers, who might be able to absorb some wage increases, may drive to the wall these higher-cost producers and thus this constant upward wage pressure when spread across all units of an industry would help bring about the very concentration of wealth into fewer companies, which we all oppose.

"Furthermore, under competition, every producer is marginal in part of his output; that is, he tends to push production until the last dollar spent on production just yields a dollar or a little more than a dollar in revenue. Now every time wages or any other costs rise, this marginal production becomes unprofitable and so some goods disappear from the market, unless prices can be raised commensurate with the increased costs. This is the reason why we cannot assume that a large lump of profits exists which can be tapped for wage increases. Thus it is pure folly to assume that wages can be increased without price effects, unless accompanied by rising efficiency."

MANUFACTURING WAGES AND CONSUMER PRICES

	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumers' Price Index	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumers' Price Index
	(In All Manufacturing)			(1935-39=100)	Index—1939=100 (In All Manufacturing)			
1939	$23.86	37.7	$ .633	99.4	100.0	100.0	100.0	100.0
1940	25.20	38.1	.661	100.2	105.6	101.1	104.4	100.8
1941	29.58	40.6	.729	105.2	124.0	107.7	115.2	105.8
1942	36.65	42.9	.853	116.5	153.6	113.8	134.8	117.2
1943	43.14	44.9	.961	123.6	180.8	119.1	151.8	124.3
1944	46.08	45.2	1.019	125.5	193.1	119.9	161.0	126.3
1945								
Jan.	47.50	45.4	1.046	127.1	199.1	120.4	165.2	127.9
Feb.	47.37	45.4	1.043	126.9	198.5	120.4	164.8	127.7
Mar.	47.40	45.4	1.044	126.8	198.7	120.4	164.9	127.6
Apr.	47.12	45.1	1.044	127.1	197.5	119.6	164.9	127.9
May	46.02	44.1	1.042	128.1	192.9	117.0	164.6	128.9
June	46.32	44.6	1.038	129.0	194.1	118.3	164.0	129.8
July	45.45	44.0	1.033	129.4	190.5	116.7	163.2	130.2
Aug.	41.72	40.7	1.024	129.3	174.9	108.0	161.8	130.1
Sept.	40.87	41.4	.987	128.9	171.3	109.8	155.9	129.7
Oct.	40.97	41.6	.985	128.9	171.7	110.3	155.6	129.7
Nov.	40.77	41.2	.990	129.3	170.9	109.3	156.4	130.1
Dec.	41.21	41.5	.994	129.9	172.7	110.1	157.0	130.7
Ann. Av.	44.39	43.4	1.023	128.4	186.0	115.1	161.6	129.2
1946								
Jan.	41.15	41.0	1.004	129.9	172.5	108.8	158.6	130.7
Feb.	40.58	40.5	1.002	129.6	170.1	107.4	158.3	130.4
Mar.	42.15	40.7	1.035	130.2	176.7	108.0	163.5	131.0
Apr.	42.88	40.5	1.058	130.9	179.7	107.4	167.1	131.7
May	42.51	39.7	1.071	131.7	178.2	105.3	169.2	132.5
June	43.31	40.0	1.084	133.3	181.5	106.1	171.2	134.1
July	43.38	39.7	1.093	141.0	181.8	105.3	172.7	141.9
Aug.	44.98	40.5	1.111	143.7	188.5	107.4	175.5	144.6
Sept.	45.41	40.3	1.126	145.9	190.3	106.9	177.9	146.8
Oct.	45.83	40.5	1.132	148.4	192.1	107.4	178.8	149.3

Source: Bureau of Labor Statistics.

Measures To Combat Unions' Portal-to-Portal Pay Suits Studied by Industry, Congress

Bills to nullify actions offered in Congress. Pittsburgh manufacturer files counter suit asking damages for production lost due to slowdowns by employees. Justice Department acts to minimize claims

ACTIONS to nullify or minimize organized labor's portal-to-portal pay claims were started last week as the total amount of claims in hundreds of suits soared above the $3 billion mark.

In Washington, bills were introduced in both the House and Senate to throw the portal-to-portal suits out of court. These measures were being studied carefully for constitutionality and congressional leaders promised that early action would be taken on relief measures.

At Detroit, Federal Judge Frank A. Picard granted the Justice Department permission to file a brief in the portal pay test involving the Mt. Clemens Pottery Co. in a move which might minimize the economic impact of the claims. The government brief would present the department's views on the ancient doctrine of law known as *de minimis*. Under this doctrine the courts can refuse to recognize "trivialities."

Counter Suit Charges Slow-downs

At Pittsburgh, the Rockwell Mfg. Co. countered a $3 million portal pay suit with a $15 million suit of its own aimed at the instigators of the portal suit and charging losses in production due to "slow-downs and admitted refusal to maintain production."

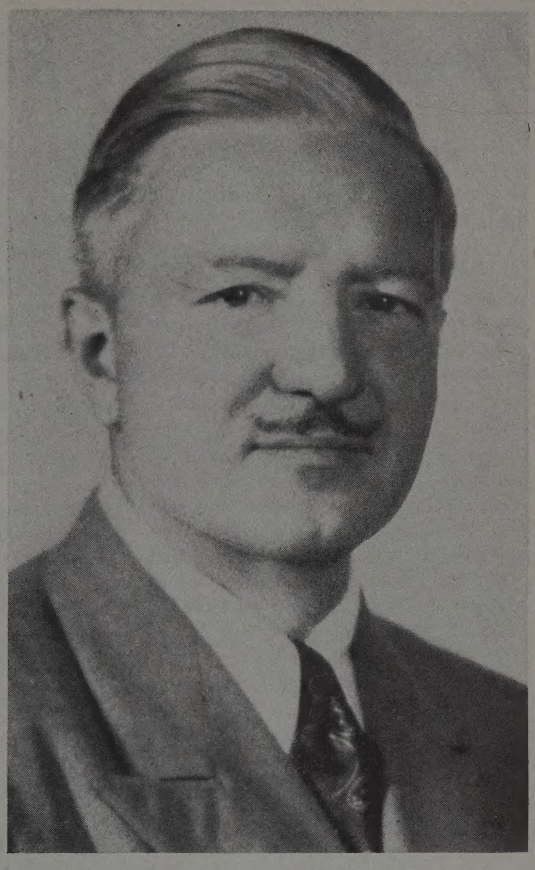
In this action, dubbed "reverse portal-to-portal" suit, the company charged that "some of our employees, in spite of a written contract, have not worked an 8-hour day or 40-hour week but have expected compensation for 8 hours in each day and 40 hours in each week."

Col. Willard F. Rockwell, president of the company, stated: "Now that the issue has been put squarely before us, it is our intention to show the extent of loss to the company arising out of slow-downs and the admitted refusal to maintain production. This is regrettable but as chief executive officer of the company I must be as fully aware of the rights of the stockholders as I am of the rights of employees. Each group must be and will be protected, but neither group will be made to suffer for the benefit of the other. All that should be expected by either is a fair day's work for a fair day's pay."

Colonel Rockwell said the basic issue is the question: "What constitutes a work-week? If after all these years it is necessary to redetermine what constitutes a 40-hour work-week, then the court should have all the facts."

The company's statement of claim alleges that production schedules required the "full application to duties" assigned each employee but that employees on whose behalf the portal suit was filed "conspired together with the intent of limiting production of manufactured items." The company also charged the same employees have "conspired to limit piecework production to an arbitrary figure selected by them" and that they "jointly and severally refuse fully to apply themselves to production."

That the 80th Congress will take some action to amend the Fair Labor Standards Act of 1938 and to limit the period for which industry may be held retroactively liable for actions under federal statutes is regarded as certain.



COL. WILLARD F. ROCKWELL

Apollo Mill To Supply Steel to 20 Owner-Users

Detroit and Chicago business interests head a group which has just completed purchase of the Apollo Steel Co.'s steel mill at Apollo, Pa., to insure adequate supplies of sheet steel in 1947 for approximately 20 manufacturing companies with plants in Michigan and other states, Irving Grayson, president of Apollo Industries Inc., has announced. The price was not disclosed.

Mr. Grayson states a 60 per cent interest in the steel mill was acquired by Apollo Industries Inc., whose stock is owned by the Detroit and Chicago interests, and 40 per cent by the Apollo Mfg. Co., whose stockholders are the manufacturing concerns whose sheet steel needs this year will be partially supplied by the Apollo mill.

Officers and directors of Apollo Industries Inc. in addition to Mr. Grayson are: Secretary and director, Leonard H. Weiner; treasurer and director, A. M. Rodecker.

Simultaneously with purchase of the properties, Apollo Industries leased its share of the steel mill for one year, with a renewal option, to Apollo Manufacturing for upwards of $1,300,000 in rentals. Apollo Manufacturing will operate the mill for the benefit of its customer-shareholders, using the technical management services of the Portsmouth Steel Co., Portsmouth, which in turn has close connections with Kaiser-Frazer Corp.

Among stockholders of Apollo Manufacturing are: Gibson Refrigerator Co., Greenville, Mich.; Atlas Tack Corp., Fairhaven, Mass.; Maremont Automotive Products Inc., Chicago; Mitchell Mfg. Co., Chicago; Western Stove Works, Culver City, Calif.; and Steel Materials Corp., Cleveland.

Dealers Sight Return to Normalcy

Present market believed natural result of more than 6 years' artificial suppression of normal laws of trading. Costing methods, conservation, other problems hold attention of industry's largest meeting

DESPITE recent gyrations in prices, the scrap market nevertheless is on its way toward stabilized and normal trading conditions.

This was emphasized by speakers at the 19th annual convention of the Institute of Scrap Iron & Steel Inc. at Hotel Commodore, New York, Jan. 6-8, and was generally concurred in by the more than 950 members who registered in the largest meeting in the industry's history.

Stressing this conviction, Edwin C. Barringer, president and executive secretary of the institute, pointed out that two months have not yet passed since government controls were lifted and that "60 days is too short a time in which to expect stability to be achieved after 6½ years of artificial suppression of normal laws of trading."

Mr. Barringer declared the scrap industry should overlook no measures in expediting a return to stability, not only for the good of the industry itself, but for the good of the economy as a whole and the American system of free enterprise.

Conservation Urged

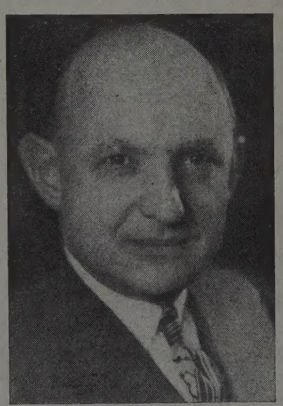
In following this general course, Mr. Barringer continued, the scrap industry also will be fulfilling another obligation to the national economy, that is, conservation of national resources. In the case of the scrap industry, these are metallics. Two wars in one generation have seriously depleted national resources. Never, he said, can a ton of iron ore that has been removed from the ground be replaced. "But," Mr. Barringer added, "every ton of scrap that you dealers make available is equivalent to two tons of ore, to say nothing of almost two tons additional of coal and other minerals. By no means insignificant is the economy which the use of scrap makes possible in lessening the requirement for transportation of these wasting national resources."

Need for prompt correction of conditions arising from wartime distortions, affecting the iron and steel scrap industry, was pointed out by Walter S. Tower, president, American Iron & Steel Institute.

Among the consequences of wartime conditions which Mr. Tower said were affecting the scrap industry and the supply of scrap is the expansion of capacity for the making of steel ingots and the development of steelmaking in new areas. Another factor, he said, has been the pressure for bringing to the market every pound of scrap that could be pried loose. Meanwhile, abnormal movements of scrap have served to deplete the accumulated reserves that normally existed in this country. Still another condition growing out of wartime distortions, according to Mr. Tower, is the labor supply problem in the scrap industry and high costs of doing business.

"All these circumstances have contributed to a present position of scrap which is far from satisfactory to the steel producers," said Mr. Tower. "They have been unable to get all the scrap which they could profitably use. They have had to deplete stocks of scrap much below the accepted margin of safety. They have had to take shipments from sources which were not logical under ordinary circumstances, thereby involving added items of cost, and it is alleged that they have had to accept shipments which did not meet completely the accepted standards of recognized grades and specifications.

"Such conditions need to be corrected as rapidly and as completely as possible in order to restore the sound basis of relations which existed between suppliers and consumers in the period prior to 1940."



PHILIP W. FRIEDER
Newly elected president, Institute of Scrap Iron & Steel Inc.

Importance of scrap in national metallics conservation was stressed by E. W. Pehrson, chief, Economics & Statistics Branch, Bureau of Mines, Washington, who called attention to the rapid depletion of high-grade open pit iron ore. According to some estimates, he said, this class of ore in the upper lake areas will be depleted within 12 years at the 1945 rate of consumption. This shortage will have to be made up where possible by development of other sources of ore. This will require time and shortages that may develop in the meantime will throw an added burden on scrap.

Looking ahead to 1970, Mr. Pehrson predicted that approximately 55 million tons of scrap will be required by the steel mills, 5 million tons by the blast furnaces and 12 million tons by the foundries. He believes that by that time about half of the steel scrap will be purchased because of improved processes in fabricating.

Mr. Pehrson urged that more attention be given to conservation of alloy scrap and for measures for better collection and segregation of this type material.

Discusses European Scrap Industry

Dr. Joseph Zimmerman, editor-in-chief, *Waste Trade Journal* and *Daily Metal Reporter*, made some interesting observations on the scrap industry of Europe, gleaned during his recent visit to England, France, Holland and Belgium. He declared that from the standpoint of physical equipment, scientific layout, labor saving devices, facilities for receiving, processing and expediting the flow of scrap, the scrap industry in the United Staates stands head and shoulders above foreign scrap iron yards.

Direct dealing and tie-in sales came in for strong condemnation at the brokers' committee meeting. Stanley Kaplan, of the M. S. Kaplan Co., Chicago, chairman, believes direct dealing is not the result of any misunderstanding between sellers and consumers and that if brokers perform their services properly direct dealing will disappear. It was proposed that representatives of the scrap industry and the steel industry meet in an effort to eliminate such practices.

At the bundlers' committee meeting, presided over by Harry Kirschman, Allegheny Iron & Metal Co., Philadelphia, the problem of revised specifications came up for special attention. Existing specifications had been in effect about 15

years and were due for a change, some of the committee men pointed out.

The price factor in bundles also came up for discussion. While it was conceded that consumers have almost arbitrary power in setting their price levels, the opinion was generally expressed that No. 2 bundles should carry the same price as No. 2 steel.

Harry D. Israel, Israel Bros. Co., Dayton, O., was appointed to head a committee which he will name later, to study existing specifications on bundles.

A cost-accounting system for scrap yards by which per-ton operating cost is established for each piece of equipment was described by Calvin Lieberman, assistant secretary, the Kasle Iron & Steel Co., Toledo, O. At the Kasle yard, cost of operating equipment is distributed to various departments, baling, shearing, metal warehouse, mixed iron or nonferrous.

In bidding for scrap, the yard takes into consideration cost of all machinery required to prepare the tonnage for shipment. Borings and turnings, to illustrate, need use of a truck and crane only; sheet scrap, the truck, baler, crane.

Explains Accounting Procedure

Operating supplies, including oil, gasoline and coal, are further broken down into individual equipment. This covers direct expense items. Indirect expenses, insurance and taxes are allocated at the end of each accounting period on the basis of tonnage handled per item in relation to total tonnage, or on the basis of time spent by a piece of equipment in a given operation. In accounting for labor costs, each employee's time is assigned to the proper department, and overhead, administrative and selling expenses are distributed on the basis of tonnage handled in each department or burden center. Net result is the Kasle yard has the cost of operating each piece of equipment as well as the cost of each department readily at hand.

The small yard dealer who keeps costs down and production up has a good future in the opinion of Edward Fields, Edward Fields & Co., operating two yards in the coal mining area, Morgantown, W. Va. The company handles both industrial and peddler scrap and also engages in steel warehousing. He stressed the value of a good reputation for shipping scrap to specification to the small dealer.

A pilot survey of scrap yards in the Baltimore district, large and small, was reviewed by Harry Berman, personnel consultant and safety engineer, that city. Only larger dealers were found alert in pre-employment physical examinations and smaller yards are lax in checking references. The "drag" system, or loans against prospective wages, are also prevalent.

Gerald M. Frank, Duquesne Iron & Steel Co. Inc., Pittsburgh, discussed the importance of individual efforts for improved public relations and a good press for the scrap industry.

Myer Schosid, Eastern Iron & Metal Co., Sherman, Tex., gave a personal report on how his company had handled public relations.

Special features of the convention included the President's Night on Monday evening and the annual banquet on Wednesday, with Benjamin Schwartz, Benjamin Schwartz Co., New York, and president of the New York chapter, serving as toastmaster.

The annual business meeting was featured by reports of the officers and committee chairman and election of directors-at-large.

Philip W. Frieder, head of the Philip W. Frieder Division, Cleveland, Luria Steel & Trading Corp., was elected president of the institute. He has been serving as first vice president, but in 1942 had been elected president. At that time, he suggested that Mr. Barringer, the executive secretary, serve in both capacities during the war. Mr. Barringer was re-elected executive secretary.

Other officers are: Edward L. Solomon, Max Solomon Co., Pittsburgh, first vice president; Marvin S. Plant, H. Klaff & Co., Baltimore, second vice president; S. Kaplan, M. S. Kaplan Co., Chicago, secretary; Samuel G. Keywell, Samuel G. Keywell Co. Inc., Detroit, treasurer. Directors-at-large elected for two years are: Abe Ashner, St. Louis; C. C. Cohen, Kansas City, Mo.; Milton Mahler, Detroit; Abe Byer, Cincinnati; David Holub, Akron, O.; I. W. Solomon, Pittsburgh; Abe Cohen, Lynchburg, Va.

Institute membership now totals 864, Mr. Barringer reported.

The 1946 Award of Merit on behalf of the scrap industry was awarded Alex Miller, Cleveland, formerly chief of the Iron & Steel Scrap Division, War Production Board.

Present, Past and Pending

■ VIRTUALLY ALL PRIORITIES NOW ELIMINATED

WASHINGTON—Priorities set up to assist industrial reconversion and aid war veterans and small business now have been largely wiped out by the Office of Temporary Controls. Action of the agency for the most part leaves only priorities in obtaining materials and equipment for military or essential utility services.

■ KAISER-FRAZER WAGE NEGOTIATIONS EXTENDED

DETROIT—Contract between Kaiser-Frazer Corp. and the CIO auto workers' union has been extended indefinitely pending completion of negotiations. The union is asking for a pension plan as well as a wage increase.

■ PLANS TO CONSTRUCT SYNTHETIC PRODUCTS PLANT

CLEVELAND—Arthur G. McKee & Co. has contracted with Carthage Hydrocol Inc. to construct a synthetic petroleum products plant at Brownsville, Tex., at a cost of $16 million. The Carthage company will utilize the hydrocol process for manufacturing synthetic products and chemicals from natural gas.

■ STEELWORKERS' HOURLY WAGE AT POSTWAR HIGH

NEW YORK—Average hourly wages paid steelworkers in November reached a new high record of 136.7 cents, which compares with the previous peak of 136.2 in September. Workers in the industry worked only 38 hours weekly during the month, reflecting the coal strike. Total wages paid dropped to $143,440,700 from $150,637,500 in October. Average number of employees climbed to the highest postwar peak, totaling 600,000 during the month.

■ AMERICAN CAN CO. TO DECLINE NEW BUSINESS

NEW YORK—American Can Co. last week announced it will allocate metal containers to its present customers throughout 1947 and decline any new business because of the shortage of sheet metal. Can manufacturers expect to receive 525,000 tons less of tin plate during the year than their estimated requirements of 3,457,000 tons.

■ WILLARD HARING, PROMINENT STEEL EXECUTIVE, DIES

CONSHOHOCKEN, PA.—Willard S. Haring, 60, vice president in charge of sales, Alan Wood Steel Co., died Jan. 7 at Bryn Mawr, Pa., hospital following an operation. He had been associated with Alan Wood since 1904, starting as a clerk in the order department. He was made vice president of western sales in 1930 and in 1937 was placed in charge of all sales.

Economics Shares Stage with Technology at SAE Convention

Cost control through minimizing of machining operations and selection of materials stressed. Secretary of Commerce Harriman tells 3000 at meeting that industrialization of backward countries has increased America's export markets

DETROIT

IN ONE of its greatest national meetings on record the Society of Automotive Engineers rolled up an attendance record of more than 3000 at the Book-Cadillac Hotel here during the week of Jan. 6.

Highlight of the convention was the address by W. Averell Harriman, Secretary of Commerce, at the banquet Wednesday evening. On the basis of his world-wide travels during the past six years, Mr. Harriman pictured the role of the United States as it looks to people in war torn countries.

"What people in those countries have heard about conditions in the United States during the past year," said Mr. Harriman, "has caused them to fear that our various readjustments will affect our ability to exert a useful influence in the development of world economy. They need a strong, stable United States.

"Here—as abroad—there is an increased desire for security. However, the American people are unwilling, as the people have in Europe, to trade opportunity for security. It is of utmost significance that the American people have no intention of giving up their system of free enterprise.

"Our government has considerable knowledge and power to exercise influence in preventing wide swings in business activity. Among the tools in its kit are fiscal and monetary policies—the power to set tax rates, prevent excesses of credit expansion and contraction and determine volume and timing of government expenditures for needed public works. Social security programs also exert a stabilizing influence on business activity. Inflationary and deflationary pressures can be substantially diminished if these tools are used wisely and at the proper time.

"But government cannot and should not attempt to do it all. If we are to attain stability in a free society, individual groups must share responsibility and play their part through greater knowledge of their own enlightened self-interest. Certainly management can continue to work toward regulation of employment in seasonal industries.

"With the great power of the American economy, we have a unique opportunity in history, in our own enlightened self-interest, to help other nations help themselves. The world desires not only American goods but also American engineering and American techniques. Industrialization of backward countries has increased their participation in world trade and has enlarged the markets for American exports."

It is significant that economics shared the stage with technology throughout the entire program of the meeting. In the more than 30 technical sessions, many of the more than 100 authors and formal discussers dealt with new designs and new methods of construction, new materials and new fuels which will enable costs to be held down despite increased labor rates and more power to be attained per pound of power plant.

Typical of such sessions was that participated in by Ralph Heintz of Jack & Heintz Precision Industries, and Paul Klotsch of Crosley Motors Inc. Mr. Heintz revealed his company's light weight, high speed version of the Skinner slide valve engine, in which many die cast and pressed metal parts are embodied. "Getting material off is what costs money these days," said Mr. Heintz; "therefore we aim at minimum machining requirements."

Mr. Klotsch showed how his company attains that end by wide use of parts built up from pressed metal details by copper-hydrogen brazing.

The same theme was stressed by F. G. Tatnall, metallurgist, Baldwin Locomotive Co., in his talk on selection of materials. He brought out the fact that through the diesel engine, the railway industry and the automotive industry are coming closer together year by year.

As the years go by it is noticeable that aviation and aircraft engineering plays an increasingly important role in SAE affairs. This year Gen. L. C. Craigie, chief, Engineering Division, Air Materiel Command, revealed the recent activities of his division and also its needs. "Some of our aircraft," he said, "are nosing into the transonic speed range, and we are developing pilotless aircraft and guided missiles for supersonic speed applications. It is in this upper realm of flight that our problems become complex. In that respect we stand about where the Wright brothers stood 40 years ago. The future of aviation depends upon the solution of many aerodynamic, mechanical and physical problems as unrelated to previous experience as were those which originally confronted the Wrights."

The overall impressions gained at the 1947 annual meeting of SAE are:

1. That the "dream-car" definitely is

CONGRATULATES NEW SENATORS: Leslie Biffle, outgoing secretary of the Senate, congratulates newly-elected senators after administering the oath of office to them Jan. 4. Left to right: Sen. Irving M. Ives (Rep., N. Y.); Sen. James P. Kem (Rep., Mo.); Sen. John W. Bricker (Rep., O.); and Mr. Biffle. NEA photo

out for the time being at least.

2. That engineers, production men and management all are doing a splendid job toward making possible soon a real good, sensible and comfortable car for all of us—at a price we can afford to pay. If labor will also throw its weight in with this co-operative effort, the big task will be accomplished and will be a success story which will impress the world.

3. That faster, more comfortable and safer flying waits primarily on adoption of things already in existence—including ground facilities.

4. That the government finally has reached realization that no theoretical planning and bureaucratic management in Washington can take the place of co-operative working with the tremendous facilities and "know-how" represented by private enterprise.

Materials Handling To Be Discussed in Cleveland

Forty industrial leaders will discuss problems relating to materials handling at the first national Materials Handling Exposition to be held in Cleveland, Jan. 14 through 17. The list of speakers will be headed by C. M. White, president, Republic Steel Corp., Cleveland, who will address the dinner session at Hotel Cleveland, Jan. 15, on the subject, "Industry's Hidden Cost: Materials Handling."

The show, first to be devoted exclusively to materials handling, has been endorsed by five major trade associations. They are the American Warehousemen's Association, the Association of Lift Trucks & Portable Elevators, the Caster & Floor Truck Manufacturers' Association, the Electric Industrial Truck Association, and the Materials Handling Institute.

At the opening session, Jan. 14, Ezra W. Clark, vice-president and general manager, Clark Tructractor Division, Clark Equipment Co., Battle Creek, Mich., and chairman of the program committee, will preside.

On Wednesday morning, Jan. 15, C. F. Kells, director of education, Electric Industrial Truck Association, Pittsburgh, will preside. E. J. Mills, transportation supervisor, Pittsfield Apparatus Works, General Electric Co., Pittsfield, Mass., will speak on centralized control of materials handling. E. I. Burke, manager of shipping, Republic Steel Corp., Cleveland, and chairman of the exposition's policy committee, and Charles M. Parker, secretary, committee on manufacturing problems, American Iron & Steel Institute, New York, will lead a panel discussion on "Iron-Steel, from Bulk Ore and Coal to Finished Steel."

Steel Price Revisions and Extra Card Changes Studied by Buyers

With latest changes on shapes, plates, semifinished and low-alloy products, current price movement is thought to be about ended. Period of stability expected, permitting consumers time to digest changes. High broker prices resisted

UPWARD revision in steel prices, including changes and additions to extra lists, continued to be announced by leading steel producing interests last week. Latest action was taken on carbon plates and shapes, on semifinished products such as forging ingots, forging and re-rolling billets and slabs, skelp, and on all high-strength low-alloy steel products. In addition coke prices were raised.

With these latest changes the current price movement is practically ended, at least on the major products. Some further revisions may be expected over coming weeks on less prominent items, but, for the most part, stability of prices at the higher levels can be expected for a time at least, permitting consumers to digest and analyze the effect of the revisions, especially in extra cards, on the cost of the steel they buy.

Increases in base prices, as a general thing, have been moderate. However, the revisions and additions in extra lists, in some instances, result in rather sharp boosts in consumer prices. As a matter of fact, the changes in extras have been received with considerable concern in some consumer circles. Further, some confusion exists with respect to exact interpretation of the new cards, in some cases uniform practice in applying charges seemingly being absent.

Some buyers feel the total increase in price to them is too high for them to absorb. For example, it is pointed out that the recent increase of $2 per ton in the base price of carbon is only a small part of the total increase in the price of this product to forgers. Increased steel costs vary among forging plants, but viewed from an overall industry basis the following appears to be the way the price and extra changes on bars work out for this industry: Base price is up $2 per ton; size extras are from $3 to $4 per ton; quantity extras are unchanged; cutting extras will average from $2 to $3 per ton; packaging, loading, building, lifting, etc., about $1 per ton; color marking 50 cents; quality and chemical requirement extras, a minimum of $3 per ton to a maximum of $8 per ton, with the average for forgers somewhere around $5.

Some forge shops estimate the total increase in bar prices to them will come out somewhere around $13 per ton, though in many cases it will be lower, depending upon the extent to which extras are applied on specific purchases. Such an increase, it is said, will hit the forging industry particularly hard since in the past it is estimated steel for production has been approximately 40 per cent of average factory cost, and in addition to steel for product, costs of steel for die blocks and other incidentals are likely to rise. Reflecting the increased cost of steel and extras into the cost of steel for product indicates a probable increase in material cost for product of approximately 22 per cent on an industry average basis for carbon steel forgings, it is said. On the basis of such increase, and reflecting it in factory cost of carbon steel forgings, it is reasoned that average factory costs of carbon steel forgings will go up approximately 10 per cent. Costs in some cases will be even higher, and in others lower, of course.

Further Revisions Expected

Expectations are extra cards may be revised as experience with them determines best practice. Actually, several revisions already have been effected in certain cards since they were issued several weeks ago. At the same time, the view is expressed that consumers will seek to hold down costs through modifications in specifications which will eliminate certain extras for size, quality, handling and packaging. How far consumers can go in this respect is uncertain but the feeling persists that considerable can be done to eliminate some of the higher costs through substitutions.

In addition to the price increases effected over recent weeks by the mills, consumers are concerned over the fanciful prices being quoted by so-called "bootlegger" brokers in practically every section of the country.

Sheet steel in quantities up to 3000 tons is reported being offered by these sellers at prices three and four times mill levels. A Milwaukee consumer, for instance, is reported to have been offered a substantial tonnage at 11½ cents per

(*Please turn to Page* 144)

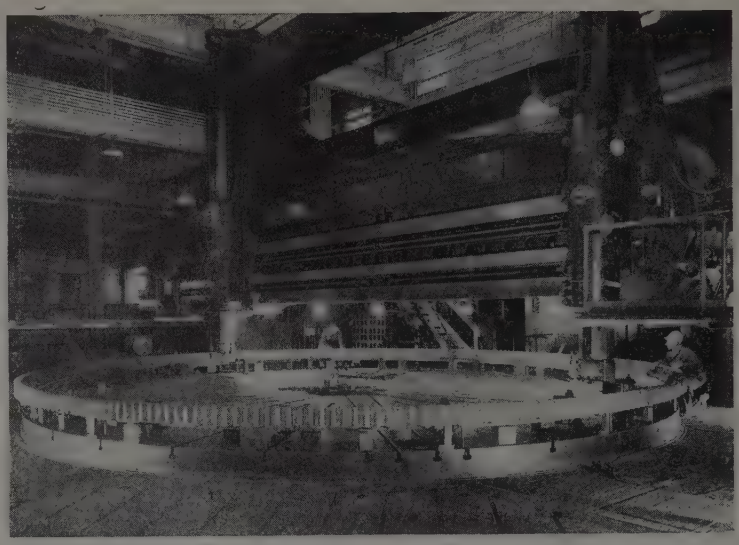
$58 Million of Cutting Tools Offered by WAA

Inventory, formerly offered for sale through industry agreements, to be sold by competitive bidding

INVENTORIES of surplus cutting tools, valued at $58 million, which were formerly offered for sale through industry agreements, will now be offered on a competitive bid basis, War Assets Administration announced last week.

The cutting-tool inventory, expected to be increased by an estimated $25 million worth yet to be declared surplus, consists of nearly 198 million pieces in 26,000 sizes.

The tools will be offered in lots of not less than $5000 in acquisition cost, and the lots will be composed of tools in three categories—new standard catalog items in original manufacturers' containers; new standard items not in original containers; and used standard tools and new special purpose tools.



REHABILITATING BRIDGE: Gear assembly from the 50-year-old Center Street bridge in Cleveland undergoes an interesting machining operation on the 40-ft boring mill in the shops of Allis-Chalmers Mfg. Co., Milwaukee. Due to natural wear and corrosion, it was necessary to recondition the groove in the base ring. As a consequence, new track sections had to be fitted, the castings for which are of a special composition extremely hard and difficult to machine. These track sections were faced on the bottom and then turned and bored to fit the trued up groove in the base ring. The gear assembly is composed of 16 sections and when repairs are completed, the bridge is expected to give another 50 years of service

Lodge & Shipley Tool Line Enlarged by Acme Purchase

The Lodge & Shipley Co., Cincinnati, has acquired the turret lathe and hand screw machine business of the Acme Machine Tool Co., Cincinnati.

William L. Doole, president and general manager, Lodge & Shipley, said this acquisition will further amplify Lodge & Shipley production of machine tools.

The purchase did not include the outstanding capital stock of the Acme company, but merely the patents, good will, patterns, trademarks, jigs, fixtures, inventory and associated items comprising the turret lathe and hand screw machine business. Plant machinery and buildings were not involved in the transaction as the present ownership and management of Acme contemplates use of these facilities in production of a small shearing machine. Readjustment of production space facilities will be necessary to accommodate the Acme operations in the Lodge & Shipley plant at 3055 Colerain Ave., Cincinnati. Until these space facilities are available, production of turret lathes and hand screw machines will continue at the present Acme plant, 4955 Spring Grove Ave., Cincinnati, but under supervision and control of Lodge & Shipley.

Steel Institute Urges Revision In Raw Materials Import Duties

DUTIES imposed on the raw materials which the steel industry must import are very high, in contrast to the nominal duties (an average of about 10 per cent on current prices) existing on finished steel products entering the country, said the American Iron & Steel Institute last week in a brief on file with the Committee for Reciprocity Information, in connection with the State Department's projected trade agreement negotiations.

The tariff imposed on raw materials, such as fluorspar, magnesite, manganese ore, tungsten ore and tungsten, constitutes a great penalty on the American steel industry, said the Institute. It estimated present duties range as high as 52 per cent of the American selling price of magnesite and 61 per cent of the American selling price of tungsten.

"These tariffs" said the institute, "unduly burden and restrict the trade in such raw products; increase the cost of manufacture of steel; tend to encourage wasteful ventures and the substitution of unsatisfactory materials and make more difficult the competition of the American steel industry with foreign steel producers."

The Institute stressed the fact that rising prices over recent years have actually constituted a reduction in the tariff on imported steel products. The reason is that the duties on finished steel are on a specific per-pound basis, as distinguished from duties on a percentage of value which provide a constant relationship regardless of shifting prices.

In addition to this factor, there was no increase in steel duties in the Act of 1930 over the low rates in the Act of 1922 and many individual rates have been reduced through a number of previous trade agreements.

The United States was declared to be the only "free market" for steel products in all the world. The Institute stated that the only way to lessen the great disparity between American nominal duties on steel imports and most other countries' high duties is to obtain concessions from other countries in the form of tariff reductions on steel.

Automotive Industry Leads in Receipts of Finished Steel

That industry, excluding tractor producers, received 10.9 per cent of all shipments in first eight months of 1946. Second and third places held by construction and container making, respectively. Proportion allotted to warehouses unchanged in August

FIRST PLACE in receipts of finished steel was retained in August as well as for the first eight months of 1946 by the automotive industry.

Figures compiled by the American Iron & Steel Institute, New York, indicate that industry, not including tractor producers, received 600,306 net tons, or 12 per cent of the total August shipments of 4,977,807 tons of all grades of steel. Over the first eight months of 1946 the automotive industry received 10.9 per cent of all shipments.

Continuing in second place in August was construction which received 444,212 tons. The container industry, which received 393,533 tons, remained in third place but was barely ahead of the retainer of fourth place, rail transportation which obtained 393,134 tons.

In August, warehouses continued to receive approximately 17 per cent of total steel shipments. Their receipts that month totaled 877,281 tons. In the first eight months of 1946, warehouses received 5,533,277 tons, or 18.6 per cent of the total shipments.

For the first eight months of 1946, consuming industries rank in order of tonnage taken: 1—Automotive; 2—construction and maintenance; 3—containers; 4—rail transportation; 5—machinery, industrial equipment, and tools; 6—contractors' products; 7—domestic and commercial equipment other than appliances, utensils and cutlery; 8—appliances, utensils and cutlery; 9—electrical machinery and equipment; 10—agricultural equipment; 11—shipbuilding; 12—oil and gas drilling; 13—mining, quarrying and lumbering; 14—ordnance and other military; and 15—aircraft.

Those 15 classifications do not include shipments to warehouses, to converters and processors, and exports.

Steel Distribution, Eight Months, 1946

(Leading products of all grades, including alloy and stainless)

Market Classification	Net Total (All Products) in net tons
Converting and Processing	2,425,074
Jobbers, Dealers, Distributors	5,533,277
Construction, Maintenance	2,748,177
Contractors' Products	906,456
Automotive, excl. Tractors	3,246,451
Rail Transportation	2,200,434
Shipbuilding	166,243
Aircraft	14,898
Oil, Gas Drilling	141,177
Mining, Quarrying, Lumbering	113,035
Agricultural	627,845
Machinery, Industrial Equip., Tools	1,339,843
Elect. Mach., Equip.	673,163
Appliances, Utensils, Cutlery	748,169
Other Domestic, Commercial Equipment	827,326
Containers	2,651,035
Ordnance, Other Military	25,376
Unclassified	3,488,280
Export	1,745,391
Total	29,621,645

Metal Stampers See Big Production Year Ahead

Output of stampings in 1947 will exceed any previous peacetime or even war years provided labor problems and labor shortages improve, according to Clarence W. Custer, president, Pressed Metal Institute, and president, American Stamping Co., Cleveland.

Fully aware of the primary role of stampings in mass production the pressed steel industry is making every effort to supply demand despite strikes, slow delivery on new equipment, shortages of steel sheets and other raw materials. These and other difficulties including OPA regulations seriously curtailed production during the first half of 1946.

New mechanical and hydraulic presses, new developments in welding and brazing, improved handling of stampings, new methods and techniques developed during the war place the industry in an excellent position to make a vital contribution to 1947 production, Mr. Custer said.

Distribution of Steel Products—August, 1946

(In net tons of leading products of all grades of steel, including alloy and stainless)

Market Classification	Shapes	Plates	Hot-Rolled Bars	Cold-Finished Bars	Seamless Tubing	Drawn Wire	Hot-Rolled Sheets	Cold-Rolled Sheets	Coated Sheets	Hot-Rolled Strip	Cold-Rolled Strip	Net Total (All Products)
Converting and Processing	3,808	27,088	185,962	13,586	12,137	73,462	58,634	3,122	677	34,691	7,746	413,900
Jobbers, Dealers, Distributors	71,024	80,931	100,240	49,370	84,655	15,457	83,688	37,611	45,072	10,714	3,960	877,281
Construction, Maintenance	149,644	90,322	25,532	446	24,664	2,314	24,193	4,348	13,692	5,933	1,337	444,212
Contractors' Products	1,674	7,545	12,054	746	5,276	2,069	49,142	24,092	25,332	7,087	4,174	154,731
Automotive, excl. Tractors	3,788	22,728	139,815	21,248	2,786	17,737	142,095	154,326	8,358	41,130	24,112	600,306
Rail Transportation	39,480	58,518	35,590	516	774	183	14,150	1,115	3,976	3,738	722	393,134
Shipbuilding	5,748	17,485	2,060	189	202	80	1,004	434	419	63	.....	28,124
Aircraft	.....	271	180	813	186	10	296	97	56	233	105	2,591
Oil, Gas Drilling	1,891	7,626	7,322	661	4,657	11	591	20	83	.....	.....	29,296
Mining, Quarrying, Lumbering	1,790	3,716	5,023	190	2,200	68	1,406	291	25	340	.....	20,856
Agricultural	3,922	6,751	36,837	6,455	161	2,524	14,940	6,853	11,078	11,887	543	110,636
Machinery, Indus. Equip., Tools	18,494	52,285	49,754	22,687	13,736	7,290	20,599	5,116	1,191	10,495	3,888	227,114
Elect. Mach., Equip.	2,856	7,819	9,646	3,843	98	3,903	19,748	6,787	2,059	6,105	4,309	109,128
Appliances, Utensils, Cutlery	207	887	1,503	3,410	286	3,564	18,298	39,405	7,340	2,803	6,035	105,860
Other Domestic, Commercial Equipment	2,095	10,702	8,925	5,011	118	20,862	22,311	27,234	4,187	8,033	13,363	134,530
Containers	41	12,706	2,939	.....	.....	7,806	51,034	18,345	3,702	13,355	8,506	393,533
Ordnance, Other Military	.....	130	541	96	91	3	163	61	12	.....	49	1,674
Unclassified	25,270	15,923	98,312	13,552	38,647	47,780	52,494	45,626	6,182	5,744	44,411	604,219
Export	18,877	27,842	19,390	1,130	16,124	6,295	21,726	10,444	6,021	4,631	910	326,682
Total	350,304	439,783	656,874	143,235	195,261	197,568	557,012	385,135	139,281	143,574	122,173	4,977,807

Windows of Washington

By E. C. KREUTZBERG — *Washington Editor, STEEL*

Representative Knutson pushes plan to reduce personal income taxes by 20 per cent. Ways and Means Committee studying two other possible revisions of tax law to eliminate double levy on corporate earnings and to prevent windfalls through retroactive wage payments

MOST interesting move, from a popular point of view, when the 80th Congress convened Jan. 3, was the assurance by the new chairman of the Ways & Means Committee, Rep. Harold Knutson (Rep., Minn.), that pre-election promises of a reduction in income taxes would be carried out. He said he hopes that his committee will be ready to report to the House no later than Jan. 27.

The bill introduced by Mr. Knutson, which now will be discussed by his committee, would authorize a reduction of 20 per cent in the current tax load on all individual incomes less than $300,000 annually. "Rich" people would get less relief. Declaring that "in general, incomes above $300,000 are unearned," the Knutson bill would reduce the tax burden on such incomes by only 10.5 per cent.

In the face of Democratic protests against this move to reduce taxes, Mr. Knutson declared the reduction could be made for the entire year 1947, while at the same time the national debt, on the basis of the current national income, could be lightened by around $4 to $5 billion.

Mr. Knutson made it plain that the majority group on his committee has no plan to lighten taxes on business at the outset. "We did as much about corporations last year as we are going to do at this time," he said.

The Ways & Means Committee will "discuss" two other possible revisions in the current tax law. One is a proposal to adopt a "windfall tax" provision that would nullify any awards which the courts may give the unions in their current suits for "portal-to-portal" pay under the Supreme Court's decision in the Mt. Clemens Pottery Co. case. Mr. Knutson said merely that this matter would be discussed. But adoption of such a proposal, he added, would force the Treasury Department to pay out many millions in refunds to employers against whom awards might be found. On the whole, Mr. Knutson's remarks indicated that he personally felt there might be better ways of taking care of the portal-to-portal pay matter.

It is expected the Ways & Means Committee will hold its fire on this issue until it sees what Congress does about limiting liability under the Fair Labor Standards and other acts for the purpose of protecting corporations against insolvency due to heavy retroactive awards.

The other potential tax law revision on which the Ways & Means Committee will hold discussions is that which would cure the current evil of double taxation of corporation earnings—once when the earnings are reported as profits, and again when individuals receive a share of these profits as dividends. This is a matter that has had considerable attention in the past, and the joint committee on taxation of the 79th Congress asked the Treasury's views on the subject.

The result is an 80-page mimeographed report entitled "The Postwar Corporation Tax Structure," prepared by Richard Goode of the Business Tax Section of the Treasury's Division of Tax Research. While the report makes no definite recommendations, it finds considerable merit in the argument that there should be a single tax—to be levied against the individual who receives dividends. Under such a system, a corporation would pay income taxes only on its undistributed earnings. Mr. Goode examines a number of different approaches, such as providing special treatment to protect the capital position of small companies when the latter can afford to pay out only a small portion

Before a joint session of Congress, members of the cabinet (seated in front row) and a packed gallery, President Truman delivered his state of the union message Jan. 6. The Chief Executive is on rostrum at left. While the President's message called for corrective labor legislation, Republican leaders asserted he did not go far enough and intimated the legislature will write its own bills. NEA photo

of their earnings in dividends. He sees possibilities in the partnership approach; each shareholder would be considered as a partner and would pay income tax not only on dividends received but also on his share of the undistributed profits. He considers such questions as to how bookkeeping complications may be avoided, and how shareholders might be enabled to pay their income taxes without having to borrow at the banks.

The report, which is expected to exert an influence on future legislation, will make interesting reading for many businessmen, especially tax and financial executives. Copies may be obtained from Louis Shere, acting director, Tax Research Division, United States Treasury, Washington 25.

The House got off to a good start on new labor legislation. Outstanding among a large assortment that went into the House hopper is the omnibus bill introduced by Rep. Howard Smith (Dem., Va.). It is a complete revision of the Wagner Act aimed at bringing complete equality of labor and industry in collective bargaining.

It is impossible to foretell at this early date what the 80th Congress will do under the head of labor legislation. The Case bill enjoys great prestige from having passed the 79th Congress, even though it later was vetoed by the President. The Case bill, it will be recalled would have: 1—Prohibited secondary boycotts; 2—banned strikes for 60 days after the Conciliation Service had taken jurisdiction; 3—outlawed unionization of foremen and supervisory employees; 4—made unions liable for damages due to breach of contracts.

Delay Seen on Controversial Issues

In addition, there are such angles as compulsory arbitration, banning of the closed shop, banning industry-wide bargaining, banning jurisdictional strikes, etc. These issues are highly controversial and, unless Congress' hand is forced by developments over the next few months it is unlikely they will be acted on with undue haste.

One of the subjects on which a lot of thinking is heard is the type of organization that should be set up to handle labor problems. For example, the Case bill would have set up a big new bureaucracy and many employers who supported the Case bill last year have changed their minds because of this feature. Among current proposals are the setting up of a system of labor courts in the chief cities. That could wait until after revision of the Wagner Act has been accomplished—and such spokesmen as Sen. Joseph H. Ball (Rep., Minn.) estimate that this may require two or three years because of the difficult problems involved.

There is some disposition among congressional leaders to wait for court action in clarifying one of the basic problems now current. That is the matter of unionization of foremen and supervisory employees. Action is expected from the Supreme Court at a fairly early date in the Packard Motor Car Co. case on which the Supreme Court started action on Jan. 8. Also, the National Labor Relations Board has asked the Third Circuit Court of Appeals, Philadelphia, to enforce its order on the Jones & Laughlin Steel Corp. to bargain with John L. Lewis' supervisory workers union as the representative of its mine foremen. The Third Circuit Court could clear this case to the Supreme Court in a matter of a few weeks, so that a decision by this court could materialize as early as April.

However, the decision in the Packard case conceivably might settle the whole matter of foremen unionization. The Sixth Circuit Court, in ordering Packard to bargain with the foremen's union, pointed out that this union is independent; the circuit court indicated that it would not have reached such a decision had the foremen joined a union which also represented the production workers.

Industry Relocation Studied

Various War Department spokesmen over the past year have thrown out suggestions about relocating industrial facilities so that in case one or more locations are bombed out in the next war production can be maintained elsewhere. There has been talk about putting key manufacturing operations in caves and in worked out mines, and about dispersing production facilities not only in various parts of the country, but also locally.

The first step in the direction of a plan for future plant locations, from the standpoint of protecting industry against interruptions and destruction in the next war, now has been taken. It is the appointment of the War Department's new Civil Defense Board, headed by Maj. Gen. Harold R. Bull. This board will be some time getting to the specific problem of keeping industry going in a future war, but that is one of its definite objectives.

The board has formulated an orderly and logical approach. It is holding a series of hearings aimed at identifying and defining the individual problems that must be solved to keep industry and the economy going in the next war.

Shortly before Mar. 1 the board will conclude this phase of its work and will report to the secretary of war on the problems that will have to be considered to protect our home front in the next war. Then the War Department will review the whole matter and prepare for the next phase; that will be to ascertain the ways and means of solving each one of these individual problems vitally identified with the national defense.

Probably toward the latter part of 1947 the board will be ready to go to work on seeking answers to the problem of relocation of industry. Expectations are that this great task will be conducted jointly by the Army & Navy Munitions Board and the Industrial College of the Armed Forces, and that representatives of the steel and all other critical and strategic industries will be called into conferences on the problem.

WAA Asks Priorities Review

Robert M. Littlejohn, War Assets Administration head, has asked Congress for a review and modification of the priorities setup under the Surplus Property Disposal Act. Priorities cause great delays and expensive field operations. If the present system is continued, he informed the outgoing House Surplus Property Investigating Committee, it will cost some $47 millions of taxpayers' money in 1947.

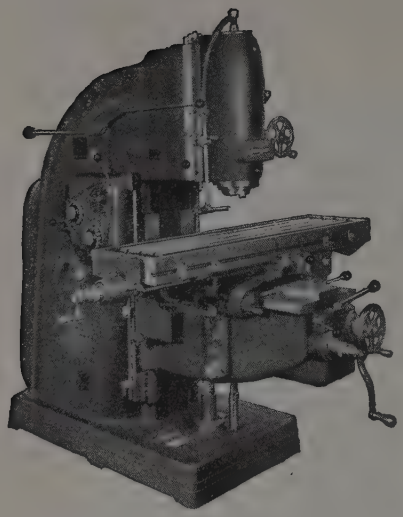
Priorities help the priority claimants only in getting goods in short supply—and the WAA already has sold nearly all these scarce items, he said. To get the non-scarce items no special treatment is needed. So the main present effect of the priority system is to delay sales to the businessmen of the country who must purchase around 80 per cent of all surplus goods if the government's inventories are to be liquidated.

The new Customer Service Center plan which has been working successfully in Kansas City and New York is being expanded to all of the WAA's 33 regional offices and to many of its district offices. Under this plan, samples of merchandise are on display, and salesmen are on hand to help customers.

Issuance of priority certificates to veterans has been stopped and there will be no more set-asides or allocations for veterans after Feb. 28. This will cut delays incidental to taking care of veterans' priorities.

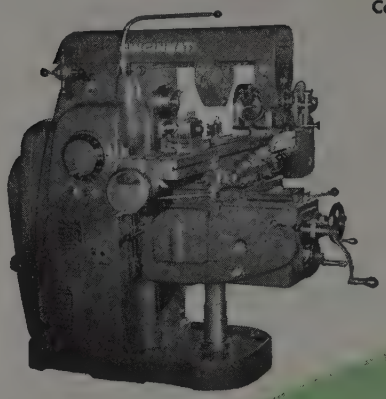
WAA also has been having a lot of trouble due to location of government-owned buildings on land not owned by the government. Under such circumstances the government is in a poor bargaining position. The WAA, said Mr. Littlejohn, should be given power to initiate condemnation proceedings.

WAA now has a force of some 58,000 people. Present plans call for reducing this number to 32,000 by July 1 and to 13,000 by the end of 1947.

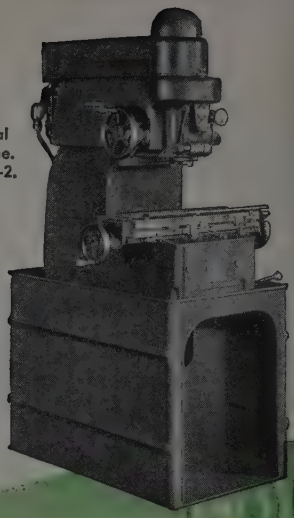


Above: CINCINNATI Vertical Dial Type Milling Machine. Catalog M-970-4.

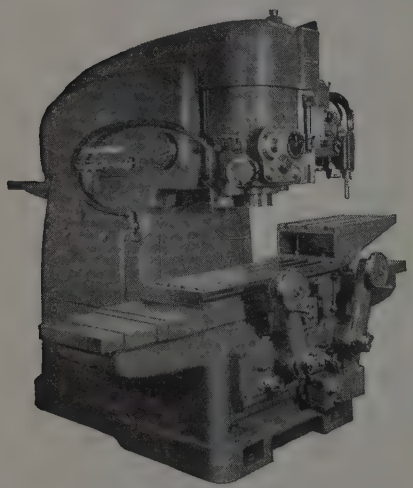
CINCINNATI No. 2 MI Universal Milling Machine. Catalog M-1506.



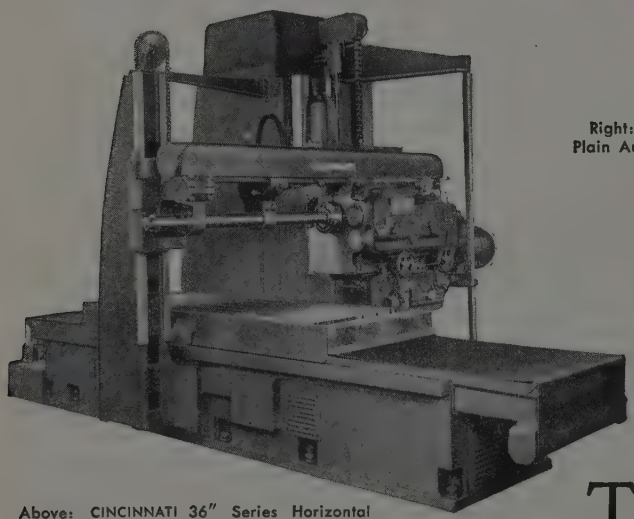
Right: CINCINNATI No. 0-8 Vertical Milling Machine. Catalog M-893-2.



CINCINNATI MACHINES for your Milling, Broaching and Cutter Sharpening Operations

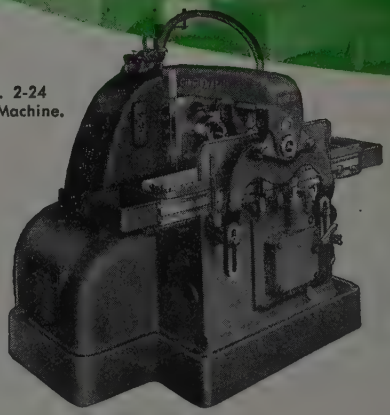


Above: CINCINNATI 16" Series Vertical Hydro-Tel Milling Machine. Catalog M-1497.



Above: CINCINNATI 36" Series Horizontal Hydro-Tel Milling Machine. Catalog M-1285.

Right: CINCINNATI No. 2-24 Plain Automatic Milling Machine. Catalog M-965-2.



THE CINCINNAT

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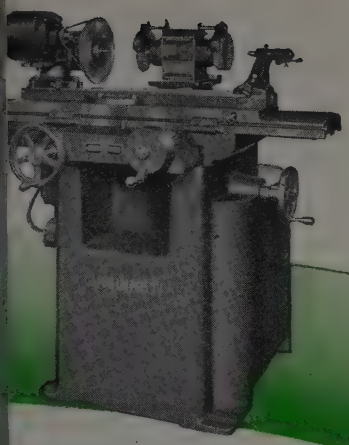
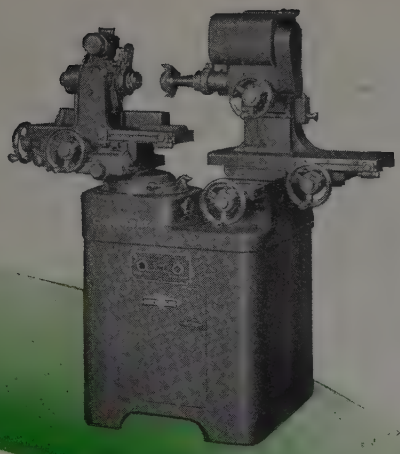
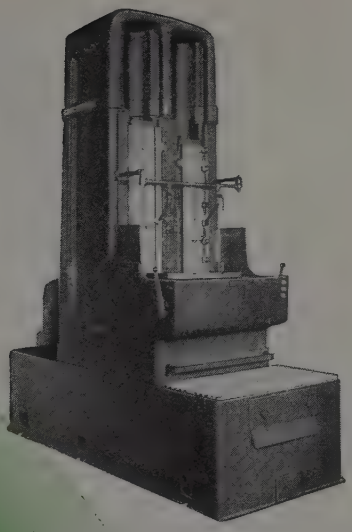


CINCINNATI No. 2 Cutter and Tool Grinder. Catalog M-962-4.



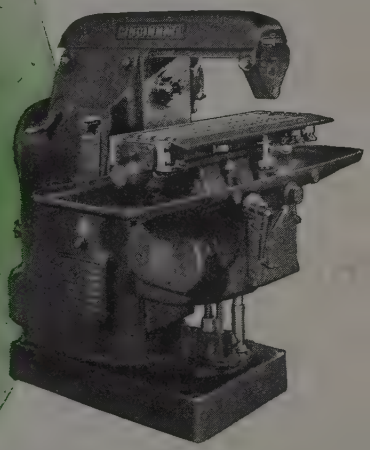
CINCINNATI Monoset Cutter and Tool Grinder. Catalog M-1386.



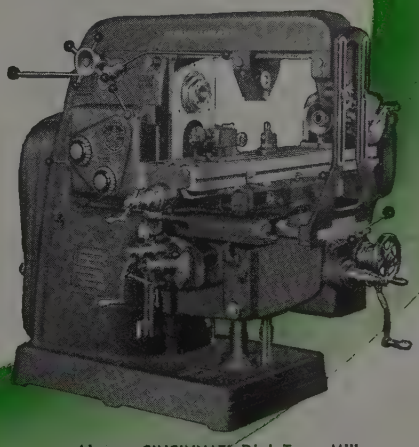
Above: CINCINNATI Duplex (double ram) Vertical Hydro-Broach. Catalog M-1387-1.

Some Cincinnati Milling Machines are on repair ships sea, ready to produce when needed. Others are in tomotive plants, perhaps tooled up by our Application gineers, producing around the clock, day in and day t. Regardless of your production requirements, one rt or millions, there's a CINCINNATI Milling or Surface oaching Machine suitable for the job. And to supply ur milling and other metal cutting machines with cor-tly sharpened cutters when needed, there are three pes of CINCINNATI Cutter and Tool rinders. ¶ Cincinnati Milling achines range from the small e h.p. 0-8's to the 50 h.p. Hydro-tics . . . Vertical Hydro-Broach achines range from one ton to tons. General catalog No. -1420-1 contains brief data on all ese machines. Write for a copy.

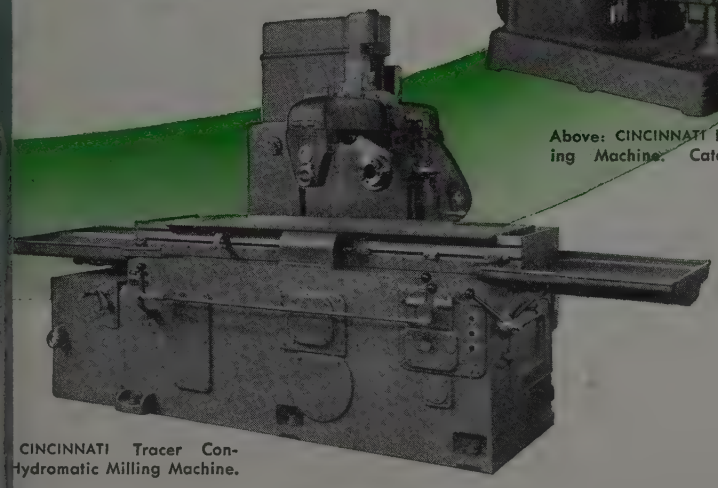
CINCINNATI



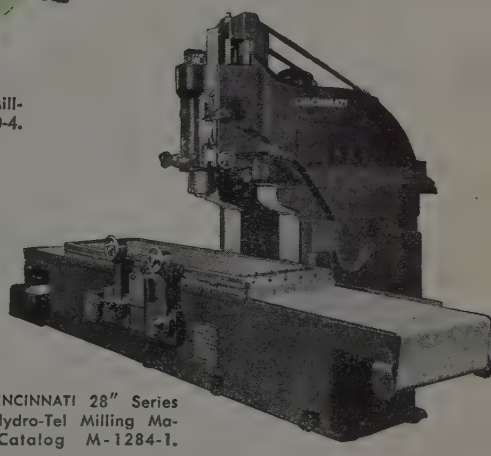
Above: CINCINNATI No. 1-18 Plain Automatic Milling Machine. Catalog M-848.



Above: CINCINNATI Dial Type Milling Machine. Catalog M-970-4.



CINCINNATI Tracer Con-Hydromatic Milling Machine.



Above: CINCINNATI 28" Series Vertical Hydro-Tel Milling Machine. Catalog M-1284-1.

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French Industrial Recovery Plan Calls for Return to 48-Hour Week

Monnet program for modernization and re-equipment sets goal as 46 per cent increase in steel production and 57 per cent increase in automobile output by 1950. Manpower and fuel shortages are cited as chief problems

PARIS

THE FOUR-YEAR plan for the modernization and re-equipment of French industry has been released in full to the nation. In releasing the plan, Jean Monnet, who was instructed by General de Gaulle about a year ago to work out the plan, gave the warning that its rejection would mean the decay of France. He said the country had no choice but to follow the example of efficiency given by the United States and Great Britain.

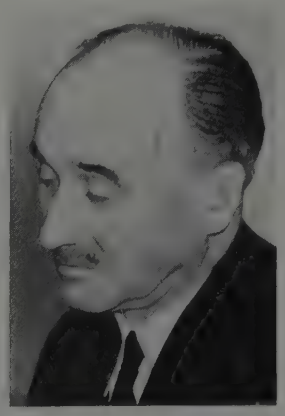
Many committees were set up to help in the elaboration of the plan, and these committees comprise representatives from the leading industries, both of management and labor, farmers and representatives from the co-operatives. Reports were prepared, covering the various industries, and one of the most important was that applying to the steel industry.

One of the arresting features of the plan is that it contains a definite condition that the country must revert to the 48-hour work-week to be substituted for the present legal 40-hour week. The main objective is to attain by 1950 an overall output greater by 25 per cent than was achieved in the best prewar year. It is stated that those chief commodities with which France can re-enter world markets are textiles, automobiles, steel and machinery. Already organized labor and agricultural workers have given their support to the plan through the General Labor Confederation and the General Agricultural Confederation.

According to the plan France should be producing by 1950: Fifty-seven per cent more automobiles and 46 per cent more steel than in 1938. Other targets for 1950 are a 13 per cent increase for coal, 20 per cent for textiles, 13 per cent for materials of construction, 40 per cent for housing and public works, 27 per cent for agriculture; all these increases to be in relation to output in 1938. The following show actual target figures relative to previous years:

It is contemplated that the United States would play an important part in supplying the necessary equipment and machinery and in financing the plan.

The plan makes it quite clear that the decision to raise the working week from 40 to 48 hours must be taken at once, without relying on imported labor. The population of France has seriously decreased since before and during the war. The Monnet plan encourages a greater birth rate. Recently it has shown an upward trend since the return of war prisoners, but it is still low, and it is foreseen that in a few years the population will be less than 30 million unless it is increased by immigration, but at present a planned immigration scheme is impossible in view of the unsettled state of Europe. Time presses as France's foreign assets are very low and rehabilitation of industry and agriculture cannot wait. Hence the necessity for a longer working week. Actually, a limited immigration movement is going on; it is expected that 13,000 Italians will have arrived by the end of January 1947, and that some 200,000 more will follow at a monthly rate of 17,000. These men will be employed mainly in the coal mines. Plans are also being discussed to accept several thousand German prisoners as free workers.



JEAN MONNET

An interesting feature of the plan is the development of hydroelectric power. France, in prewar years had to import an average of 20 million tons of coal per year in order to keep her industries going, and most of these imports came from the Ruhr district. The plan's provision to build several new dams in the Alps and in the center of France shows a desire to become independent of these coal imports and can also be looked upon as a security measure. Linked up with these problems is France's request for the internationalization of the Ruhr. The plan refers to the army and navy and recommends a rapid reduction of the forces to a point where they will suffice to preserve order in France and in her outside territories.

"France is now at the crossroads," said Mr. Monnet. "If she succeeds in bringing about the modernization of her industries she will rapidly increase her capacity of production and her productivity. If, on the other hand, the plan is discarded, decay is certain and France will drop to the level of a second rate country."

Coal production in the third week of November was 1,085,483 metric tons. Imports increased from 149,529 tons in the previous week to 207,478 tons, including 129,743 tons from the United States. Extraction of iron ore from the French mines in October reached 1,542,959 tons.

PRODUCTION
(in 1000 metric tons)

	1929	1938	1946	1947 (est.)	1950
Coal	55,000	47,000	50,000	55,500	65,000
Steel	9,700	6,200	4,200	7,000	11,000
Foundry P. I.	1,800	700	500	1,200	2,700

Lay Groundwork for Larger Engine Output in Argentina

Groundwork for extensive production of internal combustion engines for both land and ship use is being developed in Argentina.

Production is centered in a modern plant consisting of a machine shop equipped with the most modern grinders, lathes, automatic machines and calibration instruments; nine heat-treating furnaces, of which five are electric and four gas, besides ample foundry facilities heated by two modern electric furnaces.

Plan To Exchange German Information Made Public

Exchange of German technical information acquired by Great Britain and the United States since V-E Day has been announced in an Anglo-American agreement made public by W. A. Harriman, secretary of commerce, and

Sir Stafford Cripps, president, Great Britain's Board of Trade.

The American depository for German documents is the Office of Technical Services, Department of Commerce. Its British counterpart is the Board of Trade, German Division (Documents Unit).

Requests for British documents and summaries should be addressed to the OTS where the British material is abstracted and publicized through the *Bibliography of Scientific and Industrial Reports.*

U.S., Italian Firms Said To Be Planning Low Price Car

Details of an agreement between an American automobile maker and the Italian Fiat auto manufacturer in Turin, Italy, to jointly produce a car which will sell in the U. S. for under $1000, will soon be reported by the Department of Commerce, according to advices from Washington. Most of the department's information is said to be based on Italian press reports reaching this country through official channels. The name of the American manufacturer has not been disclosed.

According to department officials, the American concern will furnish the Fiat company with all coal, steel and other raw materials, and Fiat will manufacture the chassis complete with engine. Bodies will be supplied in the United States, together with tires and accessories, it is understood. It is reported that the bodies will be of plastic.

Little Relief Seen for British Manufacturers in Steel Shortage

Demand continues to outrun supply despite recent increase in production. Wisdom of exporting machinery at expense of domestic industry questioned at export conference. Castings order backlogs unusually heavy

BIRMINGHAM, ENGLAND

STEELWORKS were closed for the Christmas holidays and during the week necessary plant repairs were made.

The outlook for 1947 is somewhat uncertain, particularly for consumers of steel such as the automobile industry where plans are likely to be upset because of the shortage of sheets.

At the recent annual meeting of the Austin Co. the chairman stated that an increase in selling prices is almost certain due to smaller allocations of sheets and the consequent inevitable drop in production. This is disappointing because the Austin has been making record outputs since the war, although a large part has been reserved for export.

The wisdom of sending new machinery abroad was questioned at an export conference organized by the Federation of British Industries. Lt. Col. H. B. Riggall, president of the British Engineers' Association, said that while it was recognized satisfaction of demand for capital equipment overseas was of prime importance, doubts were increasingly being expressed whether sufficient discrimination was being exercised on a balance between the export of capital equipment as against consumer goods.

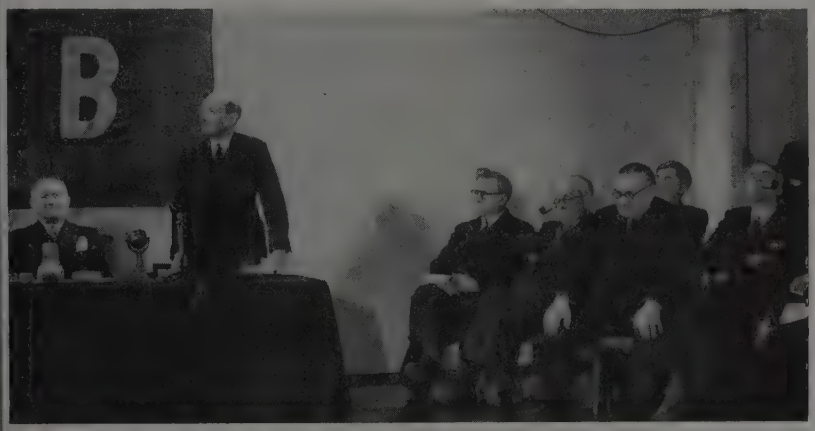
Manufacturers of goods for domestic consumption are experiencing great difficulty in obtaining machinery to enable them to manufacture, not only for home, but for export. They are being prevented from expanding by lack of the machinery which it was suggested, was being so freely exported, and thereby their potential export market was being reduced as a result of the manufacturing capacity being built up abroad by British machinery.

The outstanding feature of the latest statistics is that steel output for November was at the highest rate ever achieved in Britain at an annual rate of 13,715,000 tons. During the war the largest aggregate output was achieved in 1939 when 13,221,300 tons were produced. These figures are all the more remarkable when it is remembered that there is a general scarcity of fuel and labor, and difficulties of rail transport due to failures of old rolling stock.

There was a slight shrinkage in pig iron production in November due to a temporary stoppage of a blast furnace, the weekly average of 153,900 tons being 1900 tons below the October figures.

Rerollers continue in difficulties because of the shortage of semifinished steel. Production of wire rods, billets and sheet bars has been increased but is still short of requirements. Sheet mills are concentrating mainly on the production of sheets for housing and the automobile industry. There is a heavy call for steel plates, sections and small bars.

Manufacturers of castings, both for the domestic market in connection with housing and also in production of castings wanted in the engineering industry, are assured of work for many months to come, but full capacity has not been reached owing to the shortage of labor. Prior to the war production was about two and a half million tons of castings per annum and employment was found for 100,000 persons. The estimated production of castings for 1946 is 2,750,000 tons, and with the expanding demand is expected to rise by 1950 to 3,500,000 tons.



Prime Minister Clement Attlee and many of the British cabinet attend a party to mark the taking over of British coal mines by the government. Under the Labor government's nationalization policy, the mines have been bought by the nation and will be operated by a National Coal Board. Despite a current coal shortage, Mr. Attlee is optimistic about the future. Seated to the left of the Prime Minister is Emmanuel Shinwell, Minister of Fuel & Power. Striking a variety of attitudes as they listen on the right are, left to right: Herbert Morrison, Lord President of Council; Arthur Greenwood, Lord Privy Seal; Ernest Bevin, Foreign Minister; Aneurin Bevan, Minister of Health; and Sir Stafford Cripps, President of the Board of Trade. NEA photo

Time out to say— "THANK YOU"

The Hyatt organization, at the beginning of its fifty-fifth year, takes time out to say "Thank you."

To the many design-engineers and industrial leaders of America who have cooperated with Hyatt in fighting friction, we express our sincere appreciation.

The splendid team spirit which prevails between Hyatt and the users of Hyatt Roller Bearing products, is an asset of high value.

Much has been accomplished toward substantially increasing Hyatt's production capacity. In addition to our wartime expansion at Harrison, New Jersey, another plant in nearby Clark Township is now fully engaged in the production of Hyatt Roller Bearings and Hyatt Roller Bearing Railroad Journal Boxes.

Entering 1947 we again make a promise—which we have adhered to for the fifty-four preceding years — Hyatt Roller Bearings will embody every improvement in design and material to meet tomorrow's requirements. We shall continue to deliver roller bearings which will assure the longest trouble-free performance to the buyer. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.; Chicago, Detroit, Pittsburgh, Oakland, California.

HYATT ROLLER BEARINGS

By A. H. ALLEN *Detroit Editor, STEEL*

Mirrors of Motordom

Material requirements for 1947 production of automobiles and trucks, including replacement parts, expected to be 18.5 per cent greater than in 1946, based on expectations of total output of 5,000,000 units

DETROIT

MATERIAL requirements for this year's production of automobiles and trucks, together with replacement parts, may be 18.5 per cent beyond the 1946 total, or 40 per cent beyond the 1941 level. This is the conclusion of a survey completed by the Automotive & Aviation Parts Manufacturers Inc., and it is based on production of 5,000,000 cars and trucks in the current year, a figure coming to be accepted as well within the scope of possibility.

The 1941 sales volume of original equipment parts (exclusive of bodies, bolts, nuts, screws and parts made by the vehicle manufacturer for use in his own product) was approximately $1295 million, or $253.50 per new vehicle built. Volume of replacement parts was $599 million, making a total parts volume of $1894 million. In projecting possible 1947 sales volume of parts, the price level is adjusted to that of 1941, so a true comparison is possible.

About 2,000,000 fewer new vehicles were produced in 1946 than in 1941, resulting in a corresponding reduction in original equipment parts volume. However, the replacement parts volume was approximately 250 per cent of 1941. In 1946 the parts industry—original and replacement combined—is estimated to have used about 19 per cent more raw material than in 1941, which checks closely with statistics on steel for the first nine months of the year, as prepared by the American Iron & Steel Institute, indicating the automobile industry received 19.4 per cent more tonnage than in 1941.

Parts May Be in Short Supply

The conclusion is drawn by the AAPM that if 5,000,000 new vehicles are to be built this year and no more raw material is available than was consumed last year, then only 70 per cent of the replacement parts estimated to be required in 1947 can be produced. However, it appears likely there will be more raw material available for the automotive industry this year, if indeed it wants it.

The association has been in process of developing some further interesting studies on the relationship of sales of replacement parts versus the manufacture of such parts over the past 11 years. Suitable annual index figures were developed for both phases which give unusual insight into the inventory situation in the distributive chain. The manufacturing index, for example, ran above the sales index for the years 1935-37.

Automobile Production

Passenger Cars and Trucks—U. S. and Canada

Estimates by Ward's Automotive Reports

	1946	1941
January	121,934	524,073
February	84,141	509,332
March	140,777	533,878
April	248,318	489,856
May	247,620	545,355
June	216,637	546,278
July	331,000	468,897
August	359,101	164,793
September	342,727	248,751
October	410,466	401,369
November	380,460	373,892
December	374,210*	302,518
Total, 12 mos.	3,257,391*	5,108,992

Estimates for week ended:

	1946	1941
Dec. 21	96,754	70,875
Dec. 28	67,070	25,620
	1947	1946
Jan. 4	56,919	13,920
Jan. 11	60,000	23,340

* *Preliminary.*

On an annual basis the accumulated excess was 18.4 points at the end of 1937. Throughout 1938 and 1939 the retail sales index exceeded manufacturing, and at the end of 1939 the two indexes cumulatively were approximately in balance, the excess inventory accumulated by retailers by the end of 1937 having been liquidated. At the end of 1940 the cumulative manufacturing index again exceeded the sales index by 7.9 points, the rise being due at least in part to buying by wholesalers and retailers in anticipation of the increase in excise tax which took effect July 1, 1940.

Starting with 1941, new influences came to bear on the parts industry in the form of the first order limiting production and a general increase in consumer buying in anticipation of shortages. Limitation on the manufacture of automotive replacement parts and accessories continued until August, 1945. The cumulative index numbers showed a manufacturing deficiency of 9.9 points at the end of 1941, and the gap broadened steadily to the end of 1944 when it reached a maximum of 78.2 points, probably the greatest in the history of the industry. At the end of 1945 the deficiency had been reduced to 71.2 points and since April, 1945, the manufacturing index has consistently run ahead of the sales index, except for a brief period during the General Motors strike.

On the basis of reports for the first nine months of 1946, parts manufacturing has raced ahead of sales to the extent that 50 points of the 71.2-point deficiency probably were erased by year-end. By the end of this year, if not before, the two cumulative indexes likely will be in balance again.

GM Output 35% of Total

In making its final weekly release of production figures, General Motors disclosed its divisions built 1,134,285 cars and trucks last year, or something over 35 per cent of the total for the entire industry but still only 45 per cent of GM's passenger car total in 1941 and 70 per cent of the truck total. High month of the year was December, when 131,908 passenger cars were built, compared with only 178 in the first three months of the year. One division of the corporation—General Motors Truck & Coach—reported a yearly production total exceeding 1941.

Availability of materials is seen as limiting GM production to the December level for the first six months of this year, after which further increases should be possible. All of GM's five passenger car divisions are scheduled to be in production on 1947 models by this week.

Buick built a total of 158,728 in the 1946 series and will have the slightly revised models for 1947 coming down lines this week, after completion of inventory. Chevrolet says it has order backlogs sufficient to carry through 12½ months on passenger cars and 15½ months on trucks, producing at the current rate. In the past year, this division built 397,113 passenger cars and 270,147 trucks, or 56 per cent of the total GM output, and in addition shipped over 200,000,000 pounds of replacement parts to dealers.

First of the 1947 Cadillacs followed the last of the 1946 model down assembly lines by less than 24 hours, suggesting

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PLANNING: Consulting on plans for new passenger car models are, left to right: Harold T. Youngren, Ford vice president and director of engineering; George W. Walker, consultant on styling to Ford; and Thomas L. Hibbard, recently appointed director of styling for the company, succeeding E. T. Gregorie. Peeking out from under the shroud in the foreground is a clay model which may or may not suggest lines of the Ford of the future

how few changes were effected. In fact, virtually the only change is a new front grille, which has five horizontal bars instead of six. Some new body colors are now available and the entire Cadillac line of models will be in production, which was not the case last year. The division still has the largest unfilled order bank in history, presumably guaranteeing full output this year.

Out on the General Motors proving grounds are some Cadillacs which would confound the most expert observer. Experimental models, of course, they embody everything from rear engines to dual tires, and engineers are putting them through their paces preparatory to evolving a 1948 design which will break sharply from the present. There is a considerable concentration of GM engineering talent at Cadillac currently, confirming the previously reported possibility of the corporation's decision to concentrate radical design and mechanical changes in its larger and lower-volume models, at least for the next year or so.

Studebaker Trucks Set Record

Studebaker closed the year with the sixth best production total in its 95-year history—120,763 units. Truck output set an all-time record, topping the 1941 total by 339 per cent. Significant was the fact that production of both cars and trucks in the second half of the year almost doubled the first-half total.

Ford Seeks Cost Reduction

In a more or less routine year-end statement, E. R. Breech, executive vice president of Ford, said his company was making strenuous efforts to reduce present costs of automobiles by improvements in manufacturing methods. He predicted that prices would "spiral downward" this year, but not at the expense of wages.

Ford, incidentally, is discontinuing its employee investment plan inaugurated in 1920, as of the end of this month. Under the plan, employees could invest amounts not exceeding one-fourth of their wages or salaries, on which the company guaranteed 4½ per cent annual interest, as well as making additional returns in 15 of the past 20 years. On Aug. 31 last year, the company owed $11,252,823 in principal to its employees under the plan, a reduction of 38 per cent from the 1941 year-end figure. Participating employees were 8667. No deposits have been accepted since 1941.

Installation of 6982 fluorescent lighting tubes, each 8 feet long, is in process in the Ford engineering laboratory in Dearborn. Seven new styling studios and a display room also are being erected there, and dynamometer facilities for engine testing are being expanded and soundproofed. A motor build-up department for experimental engine assembly is being enlarged.

More Prices Advanced

More price increases in passenger cars were announced last week. Packard boosted various models an average of $62 each, after allowing for a spare tire now being shipped as standard equipment, a practice being followed by most other builders. Lower volume, higher material prices and continued inefficiency of labor were reasons cited for the increase. Even with the added amount, the company anticipates losing about $80 per car until higher production can be attained. Kaiser-Frazer also marked up price tags on its two models approximately $200 each, bringing factory list price to about $2200 and $2000, respectively. Latest K-F balance sheet shows a net loss of over $14 million for the ten-month period ending Oct. 31. The deficit resulted primarily from a policy of charging off entirely all costs on engineering, design and preparation for production, rather than to capitalize and write them off over future years. Furthermore, production of cars prior to Nov. 1 was insignificant.

Field Day for Lawyers

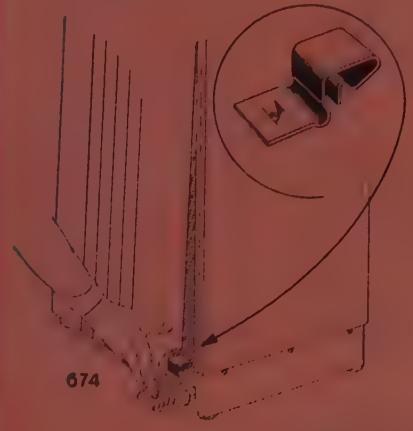
The filing by CIO unions of dozens more portal-to-portal pay suits against companies in this area is making a field day for lawyers, both corporate and union, and the entire question has come to the point where it is completely ludicrous. Conceivably the matter could be laughed out of court before the first suit is tried. Thus, lawyers for one company announce they plan to file countersuits against employees for time involved in quitting their jobs early to wash up. Another company says it will consider only individual portal-to-portal claims and will counter them with proof of more than the equivalent amount of time spent in washrooms, loafing, gambling and general stalling.

In the effort to justify its hammy dramatics in connection with the suits, the UAW-CIO all of a sudden declares it has been trying since before 1938 to persuade employers to pay men for all time spent on plant premises, and bewails the fact that most unions are incurring large expenses in their efforts to prepare suits, with any monetary awards going entirely to members and not to union staffs.

Consider the fastener!

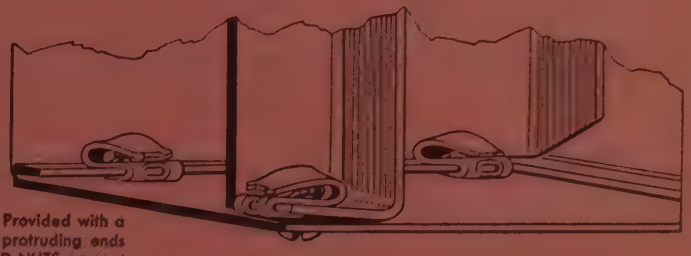
More and more Engineers are recognizing its true importance!

WATER COOLER. Here, front cover of a water cooler is hooked at the top and pre-attached SPEED NUTS snapped over the base frame to lock panel securely. Removal for service is equally simple.



COVER PLATES. SPEED NUT cover plates are easily attached and removed from one side. SPEED NUT is slipped into panel hole and screw quickly tightened to lock cover.

COOLERANT TUBES. Coolerant tubes are installed quickly and securely with SPEED NUTS. Studs are welded in place, tubes positioned and SPEED NUTS zipped over studs into locked position.



COVERED "J" NUTS. Provided with a cap to cover sharp, protruding ends of screws, these SPEED NUTS prevent damage to wires or other equipment and insure vibration-proof assembly.

Design and Assembly Engineers, who perform seeming miracles every day, are fast becoming fastener conscious. For, with improved fasteners, even greater advantages are gained. Assembly is made faster and less costly. Fewer parts are used. Weight is reduced. And—that old bugaboo, "vibration loosening" is licked once and for all.

Tinnerman SPEED NUTS, widely used in place of ordinary threaded nuts and lock washers for better assembly, are also made in hundreds of special designs. With them, engineers can accomplish today what was impossible yesterday. SPEED NUTS open the door to design possibilities never before fully explored. Look over the sketches above. These are but a few of hundreds of SPEED NUTS designed by Tinnerman to meet special needs. Possibly they will give you an idea of what can be done to secure better fastenings for *your* products.

If we can be of any help, why not write us today. Send complete details or, better still, send the product itself. We'll be glad to give you a complete fastening analysis.

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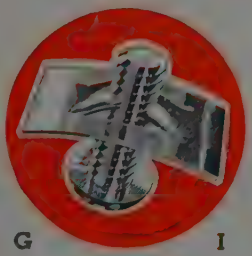

* Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS

Consolidation Of Three Steel Firms Announced

Edgar T. Ward's Sons Co. and Summerill Tubing Co. become divisions of Columbia Steel & Shafting Co.

CONSOLIDATION of Columbia Steel & Shafting Co., Pittsburgh, Edgar T. Ward's Sons Co., also of Pittsburgh, and Summerill Tubing Co., Bridgeport, Pa., has been announced by E. L. Parker, president of Columbia Steel & Shafting.

Previously the three concerns had operated as affiliated companies.

In the new corporate structure Columbia Steel & Shafting Co. is the surviving corporation, with Edgar T. Ward's Sons Co. and Summerill Tubing Co. operating as divisions.

Columbia produces cold finished steel bars; Summerill Tubing Co. Division manufactures cold-drawn seamless steel tubing and Edgar T. Ward's Sons Co. Division is a national distributor of steel products.

X-RAY ATOM-SMASHER: Dr. Fitz-Hugh Marshall, Westinghouse research engineer, and a technician preparing to take a "chest x-ray" of the 65-foot-tall atom-smasher at the Westinghouse Research Laboratories. The electrostatic generator is being readied for use in a broad program of fundamental research in nuclear physics now being carried on by Westinghouse scientists. Close-up view shows Dr. Marshall aiming the x-ray tube at the seam under examination while inside the tank a film strip is being placed in position for exposure. Cables in background carry 140,000 volts of electricity to operate the x-ray tube which is similar to the type used in hospitals for cancer treatment. A 30-second exposure provides a picture that would show any flaw in the tank's welded seams

Optimus Companies Move To Newly Acquired Plant

Optimus Equipment Co., manufacturer of metal washing and drying equipment, and Optimus Detergents Co., manufacturer of industrial cleaning materials, both of Matawan, N. J., have occupied a newly acquired plant in that city. Formerly located in the plant of Hanson-Van Winkle-Munning Co., parent organization, the two Optimus companies are now occupying six buildings of the former Matawan Tile Co. Hanson-Van Winkle-Munning will utilize most of the remaining five buildings comprising the plant.

Fellows Gear Shaper Co. Fetes 50th Anniversary

Celebration of the fiftieth anniversary of the founding of Fellows Gear Shaper Co., Springfield, Vt., was held recently by over 4000 employees and townspeople who attended an "Open House." In commemoration of the event the company has published a 48-page book entitled "50 Years of Progress," containing a history of the company and a description of its gear-producing machines.

Founded by E. R. Fellows in 1896 to manufacture a machine and a cutter to produce gears, the company began operations with a shop and equipment which cost less than $5000 and employed seven people. A large share of the company's early success originated in the infant automobile industry, which needed the Fellow's method of cutting gears for production of a more compact transmission. Added impetus to the company's growth was given by both world wars, with their increasing demands for highly accurate and complex gears. At the World War II peak, the company employed over 3300.

Metal Baskets To Be Made By New Cincinnati Firm

The assets of Valley Mfg. Co., Miamisburg, O., have been purchased by Super Market Equipment Corp., a new company, which plans to move the Valley company's machinery and equipment to a new plant in Cincinnati. The new corporation will manufacture wire baskets and carriers for grocery stores.

Veteran Employees Honored By Pemco Corp. at Banquet

Members of the Honor Service Society of Pemco Corp., Baltimore, met recently for their annual banquet and induction of new members who have completed ten continuous years of service with the company. Six employees were given their first award, and four other veteran employees were also recognized for length of service ranging from 15 to 25 years.

BRIEFS . . .

Paragraph mentions of developments of interest and significance within the metalworking industry

Link-Belt Co., Chicago, announces its Pacific Division has completed and is now occupying a newly built plant in Seattle, for production of conveying and power transmission machinery.

—o—

Plomb Tool Co., Los Angeles, has purchased the J. P. Danielson Co., Jamestown, N. Y., manufacturer of pliers, pipe wrenches and adjustable wrenches. There will be no change in management of the New York company with John P. Danielson Jr. remaining as president.

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Gabriel Co., Cleveland, announces acquisition of Ward Products Co. whose two plants in Cleveland and Ashtabula, O., produce equipment for automobile manufacturers, accessories for auto parts distributors and radio antennae for home radios.

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Bliss & Laughlin Inc., Harvey, Ill., announces opening of a district sales office in Syracuse, N. Y. James D. MacPherson, who has been with the company since 1929, has been appointed manager.

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Saginaw Bay Industries Inc., Bay City, Mich., newly formed, has placed on the market two new magnesium consumer products, an individual steak platter and a horseshoe game with the horseshoes made of magnesium.

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The Steelcraft Mfg. Co., Cincinnati, has prepared reprints of an address on metal fabricated homes as originally delivered by Al Levinson, president of that company.

—o—

O'Neil-Irwin Mfg. Co. has moved its general office and manufacturing facilities from Minneapolis to Lake City, Minn. It plans enlarged production of precision benders, brakes, shears, and dieless duplicating equipment.

—o—

Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., announced acquisition of plant and other assets of Cooper Screw Co., Los Angeles. Charles D. Brenner, formerly in charge of the New York company's Los Angeles office, is manager of sales for the new unit with R. A. MacDonald from the Port Chester office serving as plant manager at Los Angeles.

—o—

Kennametal Inc., Latrobe, Pa., manufacturer of cemented carbide single point tools, milling cutters and wear-resistant parts, recently made the following appointments: E. J. Conlan as representative in the Cleveland area; Walter R. Hammond Co., Minneapolis, as agent for Minnesota and the Dakotas, and Martin Supply Co., Tulsa, Okla., as agent for Oklahoma. Mr. Conlan formerly served on Kennametal's staff of application engineers.

—o—

Edison General Electric Appliance Co., Chicago, an affiliate of General Electric Co., announces a change in its name to Hotpoint Inc.

—o—

Steelware Mfg. Corp., Hawthorne, Calif., has resumed production of waste baskets, dust pans, tool boxes and other sheet metal products with the opening of its new 20,000 sq ft plant in the outskirts of Los Angeles.

—o—

Reynolds Metals Co., Richmond, Va., has acquired the government-owned Newark, O., aluminum rolling mill from War Assets Administration, under a five-year lease with option to purchase. The Newark plant, with approximately 28 acres under roof, was built by the government during the war at a cost of over $23 million.

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Monroe Auto Equipment Co., Monroe, Mich., announces a new series of hydraulic shock absorbers.

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Nordberg Mfg. Co., Milwaukee, has purchased Busch-Sulzer Bros. Diesel Engine Co., St. Louis. The St. Louis plant will continue production of diesel engines.

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Badger Ball & Roller Bearings Co., Milwaukee, has shortened its name to Badger Bearing Co. At a meeting of directors E. C. Roamer was re-elected president.

—o—

Fisher Body Division, General Motors Corp., Detroit, has published a 17-page booklet on "The Story of Fisher Body," giving a short history of the division.

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Illinois Manufacturers' Association, Chicago, has issued a 1947 tax calendar showing 74 federal, state and local tax returns, and tax payment or reports.

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Wheel-Home Inc., Cleveland, newly formed for manufacture of trailer homes, has leased part of a plant in Cleveland, where the firm is building an experimental model before going into production.

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Hoover Co., North Canton, O., plans purchase of the J. E. Addison Mfg. Co. building in Cambridge, O., to establish a plant for manufacture of a new product.

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Linderking Metal Products Inc., Baltimore, contract manufacturer of sheet metal items, has completed plans for erection of a warehouse on property adjoining the plant.

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W. H. Anderson Co., Cincinnati, law book publisher, announces publication of *Trade-Mark Act of* 1946 by H. A. Toulmin Jr. of Dayton, O. This is the first book on the new trade-mark law also known as the Lanham Act. Single copy costs $5.

—o—

Timken Roller Bearing Co., Canton, O., has begun operation in its new 70-acre plant at St. Thomas, Ont., Canada, with production of tapered roller bearings. John Jolly is general manager and John Trull, purchasing agent.

—o—

American Welding & Mfg. Co., Warren, O., is offering $177,000 for the government plant it operated during the war and still occupies. Property includes factory and office space of 54,900 sq ft, and was built at a cost of $619,000.

—o—

Master Tool Co., Cleveland, has purchased the former war plant of Ferro Enamel Corp., Bedford, O., from the RFC for $78,750. The plant consists of a one-story building with 32,462 sq ft of floor space and three smaller buildings. Cost to the government was $259,918.

—o—

Diebold, Inc., Canton, O., safe manufacturer, has purchased the Bank Equipment Division of O. B. McClintock Co., Minneapolis. Products made by the division will be added to the Diebold line and produced in Canton.

—o—

Hayes Mfg. Corp., Grand Rapids Mich., has acquired American Engineering Co., Philadelphia, and its subsidiaries. American will retain its corporate identity, and there will be no merger. Rensselaer M. Clark, president of Hayes, has been elected president of American.

—o—

Youngstown Sheet & Tube Co., Youngstown, is installing a cold drawn bar mill at its Brier Hill Works and a third electric weld mechanical tube mill at its Struthers plant.

San Francisco Bay Area Counts Gains; Finds Outlook "Excellent"

Survey shows many companies planning expansions for 1947, leading to integrated and diversified industrialization. Population has increased nearly 50 per cent over prewar levels. Outlook for civilian employment believed favorable

SAN FRANCISCO

IN A survey which measures 1946 growth and gauges 1947 prospects, the San Francisco Chamber of Commerce notes that "the San Francisco Bay area's business and industrial growth during the first postwar year has been healthy and sound" and that there is "compelling evidence that the outlook is excellent."

The review points out that population of the nine Bay counties now is at an estimated 2,600,000, which is a gain of nearly 900,000, or 47 per cent, over the 1940 level. Income of Bay area residents for 1946 is estimated well above $4 billion, and retail trade will amount to more than $2.3 billion. Although 1946 retail prices average about 51 per cent above prewar levels, sales are up three and a half times. The physical volume of wholesale trade has doubled, and dollar volume in 1946 reached about $4.3 billion.

"Astounding as Bay area growth has been since 1940," the chamber's review says, "prospects for continued expansion and development are excellent because of the widely diversified requirements of the greatly expanded market which includes a resident population nearly half again that of prewar years."

Employment Outlook Good

The survey forecasts an exceptionally good outlook for civilian employment. Estimated employment in the Bay industrial area at the end of 1946 was about 9 per cent above the level last spring and exceeds the prewar total by approximately a quarter of a million people.

At the present estimated level of about 800,000, employment now is only some 6 per cent under the record peak in 1943 when wartime shipbuilding was greatest.

Total manufacturing industries' wages alone in 1946 were nearly double the 1940 total, and average weekly earnings in those industries now are about 10 per cent above the level at this time last year.

As the basis of bright future prospects for industrial growth in this area, the survey points out that "big name industries are blazing new trails to western markets and bringing to the Bay area and to California opportunities for an integrated industrialization."

For example, U. S. Steel, which is investing about $100 million in its western properties, will spend about $25 million in the San Francisco area. A survey of 100 Bay area industrial firms which have announced expansions or new developments show total anticipated expenditures of $125 million. Of these, 30 firms account for $100 million, with two of them, Columbia Steel Co. and Fibreboard Products, accounting for nearly one-third.

The Chamber of Commerce points out that in 1946 the number of new industrial projects and expansions in the Bay area totaled more than 1000, with an aggregate outlay of nearly $125 million. In 1945 the number of projects was about 700, valued at about $118 million.

$156 Million Invested in New Los Angeles Plants

LOS ANGELES

In a year-end report, the Los Angeles Chamber of Commerce last week stated that $155,838,492 was invested in the area during 1946 in erection of new plants and expansion of existing ones.

In the 17 months since V-J Day investments in industrial enterprises were more than half the amounts invested during the four years of war. Some 263 new enterprises entered the area last year and 389 existing plants were expanded.

Among the largest of the new plants are those of Chevrolet, Lincoln-Mercury, Nash-Kelvinator, Kaiser-Frazer, American Anode, the Meyercord Co., Trav-ler Radio Corp., Shakespeare Products and Shelby Bicycle Co., American Radiator and Standard Sanitary Corp. and the Bates Expanded Steel Corp., Chicago.

Illinois firms ranked first in establishment of new branches in Southern California last year, with New York second and Ohio and Pennsylvania following.

Consolidated Steel Corp. Awarded Pipeline Contract

LOS ANGELES

El Paso Natural Gas Co. has awarded Consolidated Steel Corp. a contract for the fabrication of approximately 100 miles of 26-inch outside diameter welded steel pipe, to be delivered during 1947. Total contract price exceeds $2,500,000.

The above 100 miles, which will be laid east of the Colorado River, represents a link in the new $70 million 1200-mile high pressure California-Texas gas pipe line now under construction from the Mid-Continent fields in Texas to Southern California.

CRANE BY AIR: A 10-ton, 37-foot span, double girder overhead traveling crane recently was shipped from Chicago to California by the Industrial Division of H. D. Conkey & Co., Mendota, Ill. The crane was shipped in two sections, one to a plane. Photo shows workmen loading one section aboard plane at Chicago Municipal Airport

Advancing Prices Add Confusion to Northwest Trade

Several major construction projects delayed as costs exceed estimates. Contractors reluctant to proceed

SEATTLE

CONDITIONS in the Pacific Northwest steel industry are confused and uncertain. Prices have advanced to a point where several major construction projects have been delayed indefinitely. Producers are giving estimates but business is not being placed. Contractors are in a tight spot because they cannot obtain firm prices and definite delivery dates. In many instances they have refused to bid as the gamble is too great.

Inefficiency of labor, which is still demanding higher wages, is one of the outstanding factors.

As an illustration, Washington state has rejected the sole bid of Columbia Steel Co., $320,849 for 1000 tons of steel for a Columbia River bridge at Northport. New tenders will be invited about April, depending on condition of the market at that time. Work on Sears Roebuck's automobile deck, Seattle, involving 300 tons of reinforcing, has been postponed. Four bids for the $2½ million Yakima hospital, involving 300 tons, are under consideration, the project probably postponed.

In many instances bids are double the estimate and in some cases three times. Many builders have abandoned plans after receiving cost estimates. There is an abnormal amount of projected construction but the tempo is being slowed by current conditions. Some contracts have been placed with cost-plus and escalator clauses.

The situation places mills in an unfortunate position as they cannot figure future operations. If builders remain hesitant future bookings will be so light that plants will have to restrict operations. If the potential buying is released they will be swamped with orders.

In view of lack of large placements, rolling mills are rapidly reducing backlogs. Small orders are being taken for regular customers but future commitments are being carefully considered.

Operations continue at a steady level. Northwest Steel Rolling Mills has resumed operations following annual overhaul. Bethlehem Pacific has taken 100 tons for plant addition of Washington Co-op Egg & Poultry Co. Rumsey & Co., Seattle, has a state contract for two concrete girder bridges and overcrossing in Yakima county, reinforcing tonnage unstated. Washington state will open bids Jan. 14 for three projects involving 100 tons of bars. H. S. Wright & Co., Seattle, has a $2½ million contract for erection of new newspaper plant for the *Post-Intelligencer*, Seattle. Bids will be opened at Spokane Feb. 7 for $3 million construction program at Washington state college, Pullman. University of Washington has C.P.A. approval for building program in excess of $9 million.

Union in Jurisdictional Dispute Over Pay Suit

SAN FRANCISCO

An interunion dispute has arisen between the CIO and AFL over which has jurisdiction in filing portal-to-portal pay suits against the Geneva Steel Co. in Utah.

This situation came to light recently following filing of a portal-to-portal suit for $2.3 million against the company by the United Steelworkers of America, a CIO union.

In answer to the filing, C. R. Van Winkle, AFL representative of Provo, said the CIO suit "can bring harm to the workers involved. It was filed for publicity purposes to mislead workers at the plant and it was poorly prepared because of lack of knowledge of the actual case.

"The American Federation of Labor," he continued," is carefully investigating and preparing a suit designed for the purpose of having the courts rule upon the actual rights of individual employees based on conditions under which they are employed."

The American Federation of Labor is the principal bargaining agent for employees at Geneva.

Mr. Van Winkle, according to reports reaching here, would not estimate the amount of money to be involved in the AFL suit. The action has been discussed with company officials and the suit is being prepared by AFL legal counsel in Washington.

When the suit is filed, probably late this month, it is expected to cover Columbia Steel Co. workers at the Ironton, Utah, plant from the time the Ironton plant was taken over by Geneva Steel Co. until the present.

Meantime, the Geneva plant has recovered from the temporary setback experienced last month during the coal strike and operations are reported to be proceeding normally according to plans of the company to steadily increase production.

Kaiser Plans To Develop Eagle Mountain Mines

Railroad to connect with Southern Pacific line and 100-home housing project included in development program

LOS ANGELES

SPOKESMEN for the Kaiser steel interests have announced plans for development of the Eagle Mountain iron mines near Mecca, Calif., which include a railroad to connect with Southern Pacific lines and a 100-home housing project for workers near the site.

The ore deposit is still a matter of unsettled litigation between Edward T. Foley, leaseholder on the mine, known as the Iron Chief, and Harlan H. Bradt, mining engineer, who recently charged that Foley had sold to Kaiser without authorization, according to Hammack & Hammack, Bradt's attorneys in Los Angeles.

The current housing project became a matter of record when Kaiser purchased a 600-acre tract near the mine site from the Citizens National Bank of Los Angeles. The rail spur will be built from Eagle Mountain to the Southern Pacific line just north of Salton on the north shore of the Salton Sea.

Test drilling by the Bureau of Mines has indicated that the deposit will yield blast furnace grade ore usable without processing. The operation will be of the open pit type and ore will be removed by power shovels and trucks, which will transport it to a primary crusher and then dump it into railway cars for carriage to the main line.

Plans call for extraction of up to 3500 tons of ore per day. Geologists have said the ore body will last the Kaiser Fontana mill at least 50 years at foreseeable production levels.

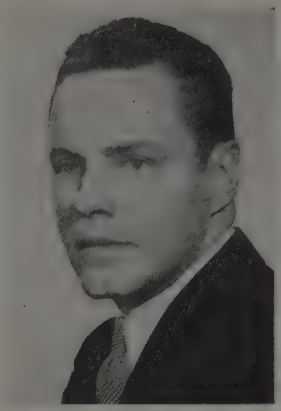
Bulldozers, scrapers, trucks and other heavy mining equipment have been shipped from Los Angeles recently by the Pomona Mining Co., headed by Everett H. Jones, to a promising copper-silver strike in the Gardner Canyon region of the Santa Rita Mountains, 30 miles east of Nogales, Ariz.

The deposit, discovered four years ago, is an outcrop on a mountainside, well adapted to glory hole operation, it is said. Assays indicate 3 per cent copper and 17 ounces of silver per ton of ore, carried in highly siliceous gangue.

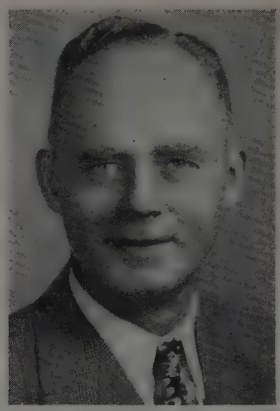
Phelps Dodge at Douglas, Ariz., is reported to have contracted for the ore.

Men of Industry

HUGH D. LARGEY



HARVEY N. BARRETT JR.



T. E. ANDERSON

Hugh D. Largey, Pittsburgh, has been appointed manager of refractory sales for Basic Refractories Inc., Cleveland. **D. B. Baxter,** now assistant to Mr. Largey, succeeds him at Pittsburgh as district sales manager. **George W. Edwards,** formerly melter at Republic Steel Corp. plant, Buffalo, becomes assistant sales engineer at Pittsburgh.

—o—

Harvey N. Barrett Jr. has been appointed assistant to the president, Basic Refractories Inc., Cleveland. Since his return from military service, Mr. Barrett Jr. has been serving as manager of sales development. **Gordon E. Tomb,** now assistant sales engineer for the Cleveland District, is appointed manager of B.R.I. gun sales.

—o—

M. L. Van Slyck has been appointed editor, *NAM News,* weekly publication of National Association of Manufacturers. Mr. Van Slyck was once an associate editor of *Newsweek,* and business editor of *Chicago Journal of Commerce.*

—o—

R. G. Willaman has been promoted to vice president and sales manager, Peterson Steel Inc., New York. **Daniel B. Hassinger** has been promoted to secretary and New York district sales manager. **H. J. Lawson Jr.** has been promoted to manager of the order department, and **R. F. Fischer** to assistant secretary of the company. These appointments became effective Jan. 1, 1947.

—o—

Herbert Metz was appointed a member of the executive committee of Graybar Electric Co. Inc., New York, and also to the position of eastern district manager. He succeeds **W. J. Drury,** vice president and eastern district manager, who is retiring after serving over 42 years with the company. **A. C. Lamperti** was elected a director of the company. Mr. Lamperti has been with the company since 1920. He was named Graybar secretary and comptroller in 1943 and will continue these duties. **H. L. Harper,** Pacific district manager at Los Angeles, was designated a voting trustee.

—o—

Reese Tucker, secretary - treasurer, Western Pipe & Steel Co. of California, San Francisco, has resigned. He will join Hood & Strong, San Francisco, certified public accountants, with whom he was formerly associated.

—o—

Samuel L. H. Burk has been appointed industrial relations director for Pittsburgh Plate Glass Co., Pittsburgh. He succeeds **Erson V. Ogg** who resigned to serve as a private engineering consultant. Mr. Burk has been associated for the past 12 years with Atlantic Refining Co. and was given leave during the war to serve in consultant and executive capacities with three war emergency agencies.

—o—

Arthur B. Studley, assistant manager of the Boston district office of SKF Industries Inc., has been elected chairman of the Textile Division of the American Society of Mechanical Engineers.

—o—

William K. Divers has been appointed assistant administrator of the National Housing Agency. He has had a wide experience in the field of housing. He was formerly special assistant to the Housing Expediter.

—o—

Oliver C. Ralston has been appointed chief of the Metallurgical Branch of the Bureau of Mines, Washington. **R. G. Knickerbocker** has been transferred from the Metallurgical Division, Boulder City, Nev., to the position of chief of the Rolla, Mo., Metallurgical Branch.

—o—

T. E. Anderson has joined the sales organization of the Ohio Ferro-Alloys Corp., Canton, O. He had previously been associated with the Industrial Sales Division of National Gypsum Co., Pittsburgh district.

—o—

B. P. Mulcahy has opened offices in Indianapolis as engineering consultant on cupola operation and coal carbonization. Mr. Mulcahy, for the past 11 years, was research engineer for the Citizens Gas & Coke Utility, Indianapolis.

—o—

W. C. Bower, vice president, purchases and stores, New York Central railroad, retired as of Dec. 31. He is succeeded by **F. S. Austin.**

—o—

Stanley C. Hope, president, Gilbert & Barker Mfg. Co., Springfield, Mass., has also been elected president, Stanoc Inc., Linden, N. J. Both companies are affiliates of Standard Oil Co., New Jersey.

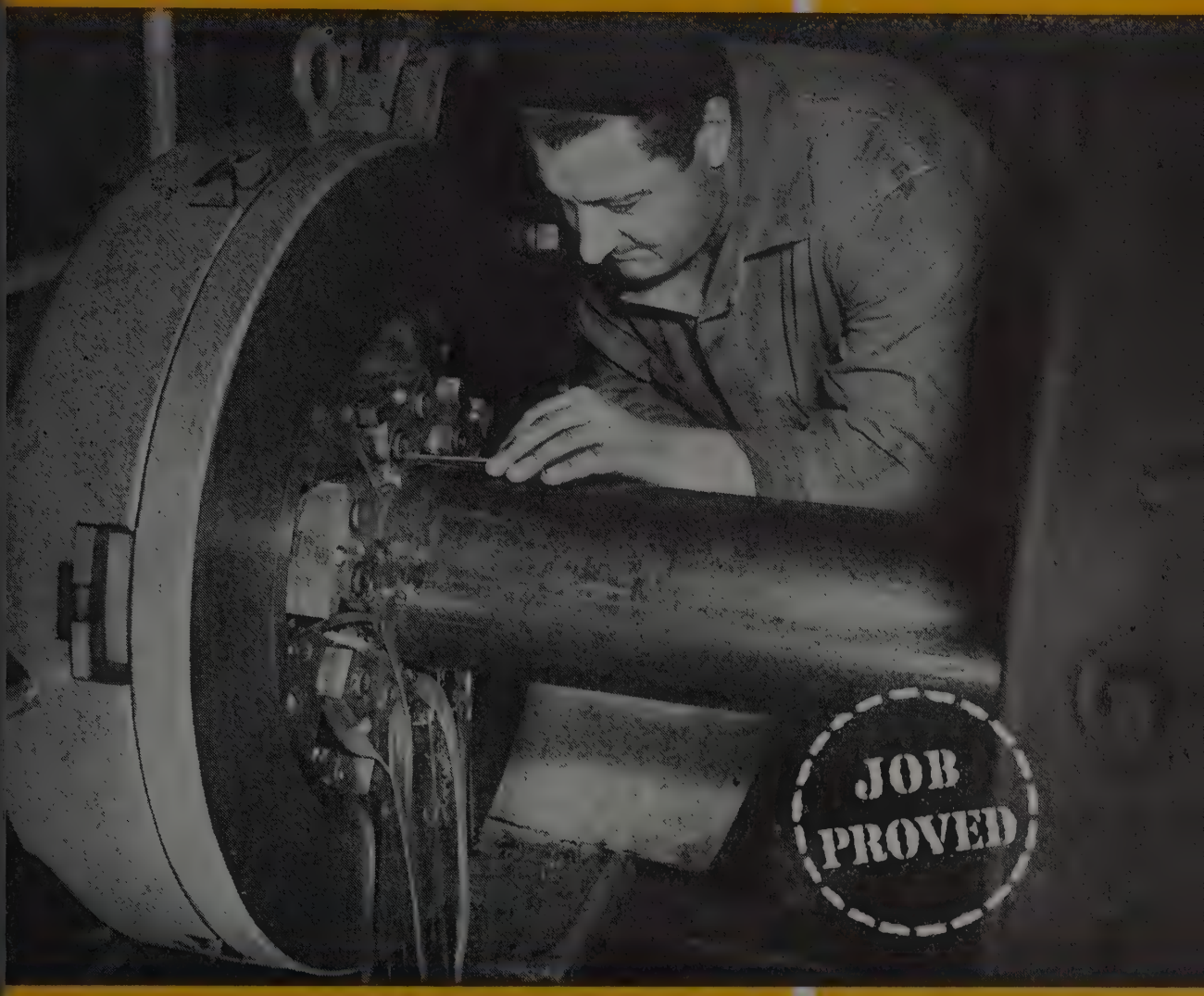
—o—

Philip W. Pugh has been appointed manager, range sales, of the Crosley-Division-Aviation Corp. His headquarters will be in Cincinnati. Pugh has been affiliated with Crosley as promotional manager of the central region since 1945. Mr. Pugh during the war served with the radio division of the U. S. Signal Corps.

—o—

A. W. Gilmore has been appointed manager of a new Wire & Cable Division, General Electric Co., Bridgeport, Conn. The new division is a consolidation of the former York, Pa., Wire & Cable Division and the Bridgeport Wire & Cable Division. The following will assist him: **M. H. Owen,** manager, York

Cutting Better Threads...Faster



SUNICUT 196...

Speeds Up Threading of Automatic Sprinkler Pipes, Improves Quality of Threads

Here is a case where a big manufacturer of automatic fire-sprinkler systems increased production and improved his threads by replacing a special, expensive oil with Sunicut 196.

Machine: No. 5 Landis Pipe-Threading Machine.
Operation: Threading ⅜" to 8" Pipe. **Lubricant:** Sunicut 196.

In this case, a saving of 15% in oil costs resulted. This is a typical example of how Sun's "Job-Proved" cutting oils have aided in speeding up production and in reducing costs.

Machine-tool operators prefer Sunicut because it is a clear, transparent, free-flowing, sulphurized mineral oil. Sunicut is recommended for those exacting jobs where an emulsifiable cutting oil is not suitable.

Other "Job-Proved" Sunicut grades are suitable for use on automatic lathes, gear-cutters, etc. Contact the nearest Sun office for recommendations.

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SUNOCO
INDUSTRIAL
PRODUCTS

SUN OIL COMPANY · *Philadelphia 3, Pa.*
Sponsors of the Sunoco News-Voice of the Air — Lowell Thomas

sales section; **A. E. Newman,** manager, Bridgeport sales section; **C. O. Hull,** engineer; **S. T. Powell,** manager of manufacturing; and **A. Hillman,** accountant.

—o—

Carl F. Graesser has been appointed sales manager of thermosetting molding materials for Monsanto Chemical Co.'s Plastics Division, Springfield, Mass. He is succeeded as assistant sales manager by **C. L. Richards Jr.,** formerly branch manager of the division's St. Louis office. The St. Louis branch managership has been assigned to **T. J. Martin,** formerly a salesman in the division's Connecticut territory. **W. H. Face** has been named assistant to the sales manager of thermoplastic molding materials.

—o—

Louis S. Kimball, general manager, Fluorescent Fixture Division, Sylvania Electric Products Inc., Boston, has been elected vice president in charge of operations of Colonial Radio Corp., a subsidiary of Sylvania Electric, with headquarters at the main office of Colonial, Buffalo, N. Y.

—o—

Fred B. Croner has been named assistant to the vice president in charge of Transit Equipment Division, Marmon-Herrington Co., Indianapolis.

—o—

L. R. Milburn, electrical engineer, Great Lakes Steel Corp., Ecorse, Mich., has been elected president of the Association of Iron and Steel Engineers for the year 1947. Mr. Milburn became associated with Great Lakes Steel in 1929 after previous experience with General Electric Co. and Louisville Gas & Electric Co.

—o—

W. R. Persons has been named sales manager, Lincoln Electric Co., Cleveland. He has had a variety of sales experience with the company. **C. M. Taylor** was recently advanced to executive vice president.

—o—

C. H. Lenhart, formerly assistant general superintendent, Kaiser Co. Inc., Fontana, Calif., has been promoted to general superintendent. **E. F. Donatic,** formerly assistant superintendent of general maintenance, has been promoted to superintendent of general maintenance.

—o—

Henry B. Flinn has been appointed assistant publicity manager of the Fellows Gear Shaper Co., Springfield, Vt. He has been associated with the company over 30 years.

—o—

M. S. Huberman has retired as a general partner of Mars Metal Co., San Francisco. **Hugo F. Forster** succeeds him.

—o—

Thomas M. Chalmers has retired as vice president in charge of operations of the Tennessee Coal, Iron & Railroad Co., United States Steel Corp. subsidiary. He will serve as an operating consultant to **Arthur C. Wiebel** who succeeds Mr. Chalmers as vice president. **A. B. Haswell** was appointed vice president in charge of engineering.

—o—

L. Abbett Post has been elected executive vice president of the American Institute of Steel Construction. He succeeds **Robert T. Brooks** who is retiring after 11 years in that capacity. Mr. Post has been on the Institute staff since 1942, for the past year as assistant executive vice president. He is also president of the Trade Association Executives in New York.

—o—

Arthur Tuckerman has been appointed director of public relations, American Car & Foundry Co., New York. Mr. Tuckerman joined ACF as assistant to executive vice president in the field of public relations in January, 1945, following his release as a lieutenant commander in the United States Naval Reserve.

—o—

C. H. Goddard has been appointed general manager of the Fluorescent Fixture Division, Sylvania Electric Products Inc., with headquarters at the Ipswich, Mass., plant. Mr. Goddard became associated with Sylvania in 1944 as merchandise manager of the Fluorescent Fixture Division, and in 1946 was made assistant general sales manager of lighting products.

—o—

Ellis Hunter, president, British Iron & Steel Federation, London, England, has agreed to stay in office for another year. Mr. Hunter is deputy chairman and managing director of Dorman, Long & Co. Ltd.

—o—

William J. Reagan, associate professor of metallurgy, Pennsylvania State College, has been elected chairman of the Electric Furnace Steel Committee, American Institute of Mining and Metallurgical Engineers. Mr. Reagan succeeds **C. W. Briggs,** technical advisor, Steel Founders' Society of America, Cleveland. Mr. Reagan had been chairman of the electric furnace steel conference committee and has been active in the work of this group since its inception in 1943. Prior to his present position he was research metallurgist for the Copperweld Steel Co. He joined the faculty of the Pennsylvania State College in July, 1946.

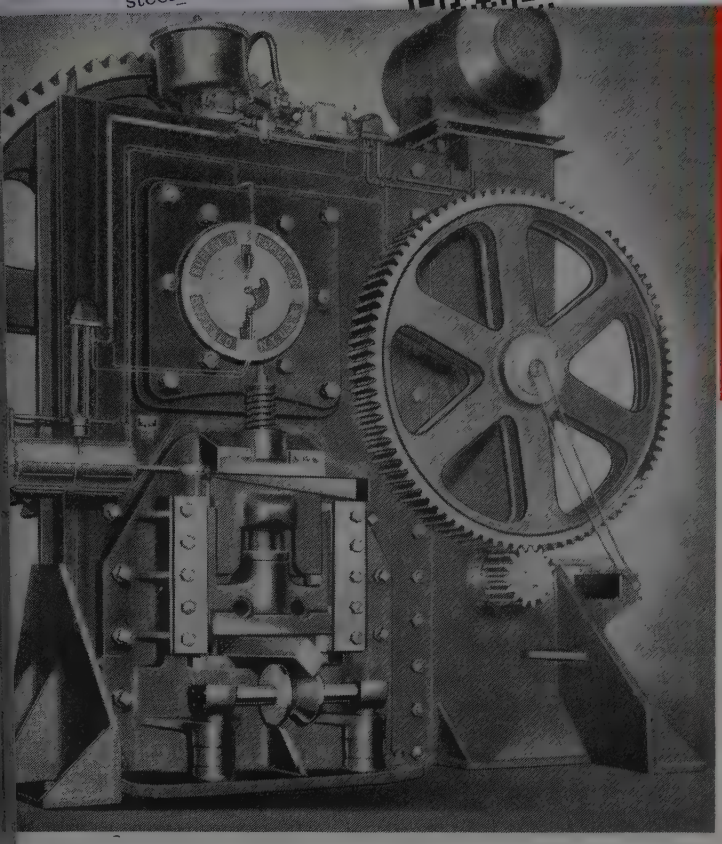
—o—

Frank B. Lounsberry, formerly vice president in charge of methods and processes, Allegheny Ludlum Steel Corp., Pittsburgh, has been appointed technical director of the company. He succeeds **Vere B. Browne** who joined the company

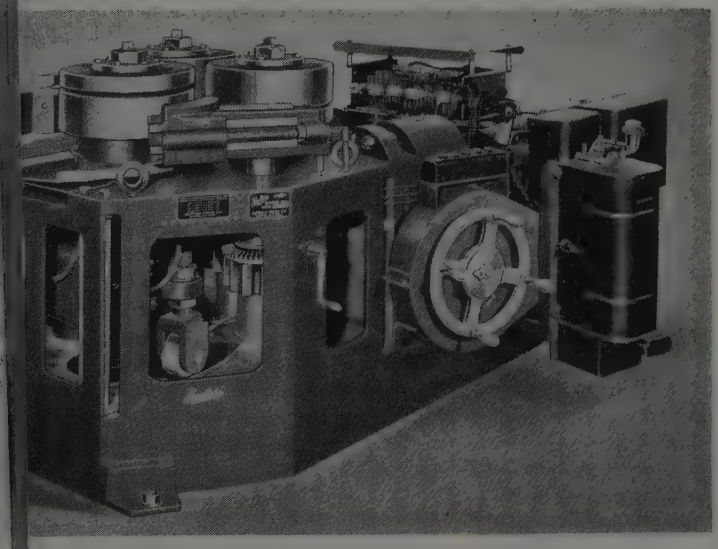
L. R. MILBURN

L. ABBETT POST

WILLIAM J. REAGAN



Buffalo Billet Shears, above, cut up to 10" forging stock into billets of uniform weight, with no "smearing" or notching.



Above, the Buffalo Bending Roll, which cold-rolls flanges, rims, ring gears, segments, and many special shapes with astonishing ease and speed.

Good for a SHOP-FULL OF FABRICATION JOBS

"Buffalo" MACHINES Cut Costs!

- Throughout the metal working industries . . . in maintenance, construction and very often straight production work . . . you'll find "Buffalo" machines "eating up the work" in such rapid, accurate style that turnout costs have invariably been *cut*.

- Wherever there is heavy-duty cutting or punching to be done . . . and done in a hurry . . . in your plant, you can handle such operations "by the shopful" with the right "Buffalo" machine.

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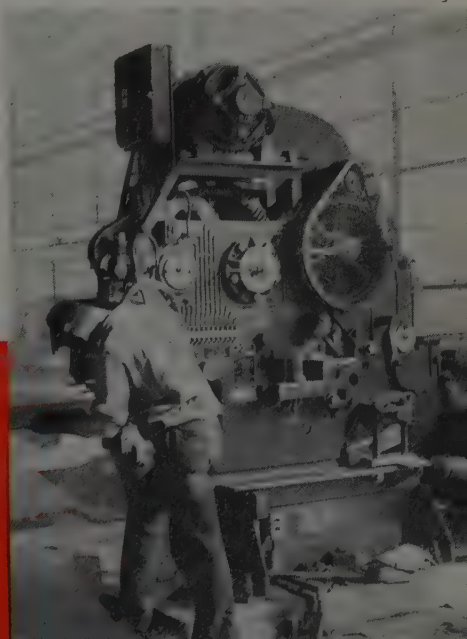
158 Mortimer Street **Buffalo, N. Y.**

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Often called the "most useful machine in the whole shop", the Buffalo Universal Iron Worker, below, can cut, notch, slit, punch or cope angles, tees, squares, beams, rounds, flats and special shapes.



"Buffalo"

- BILLET SHEARS
- BENDING ROLLS

UNIVERSAL IRON WORKERS

H. C. CRAWFORD

L. H. SCHNEIDER

GEORGE R. INGERSOLL

in 1909 and served as vice president for 16 years and technical director for three years. Mr. Browne becomes an honorary vice president and will be available as a consultant.

—o—

H. C. Crawford has been named traffic vice president, Bethlehem Steel Co., succeeding **H. M. Gross,** retired. Mr. Crawford's first association with the steel industry was with the U. S. Steel Corp. He joined Cambria Steel Co. in 1914, and was later with Midvale Steel & Ordnance Co. When Bethlehem acquired Midvale in 1923, Mr. Crawford came to Bethlehem. For the past 10 years he has served as general traffic manager. He is succeeded in that position by **F. M. Huffman** who has been affiliated with Bethlehem throughout his business life.

—o—

A. C. Fetzer, vice president, Mack Mfg. Corp., has been elected to the board of directors of that corporation. Mr. Fetzer, formerly acting general sales manager, has been appointed general sales manager.

—o—

Kinter Berlebile has retired from Bethlehem Steel Co., Bethlehem, Pa., after 24 years of service. He was in charge of wire and wire products sales and supervised accounts of farm and carbuilding equipment.

—o—

Thomas F. MacLaren has been placed in charge of the Philadelphia office of Brown & Sharpe Mfg. Co., Providence, R. I. He succeeds **Harry G. Leighton** as manager. Mr. Leighton retires after 40 years service with Brown & Sharpe.

—o—

A. R. Stargartder has been named metallurgist of the Washington Steel Corp., Washington, Pa. Formerly chief metallurgist for the Gillette Safety Razor Co. and chief metallurgist for the Eastern Stainless Steel Corp., he has been continually connected with the steel industry since 1916. During the war he served as a member of the War Production Advisory Committee.

—o—

L. H. Schneider has been elected president, Toledo Stamping & Mfg. Co., Toledo, O. Mr. Schneider has been general manager of production. He joined the company in 1944.

—o—

Carl W. Littler, chief engineer, Jones & Laughlin Steel Corp., Pittsburgh, has retired after 44 years service in the engineering profession, most of them with the steel industry.

—o—

Paul R. Pollock has been named manager of the Denver, Colo., office of the Allis-Chalmers Mfg. Co. **Henry H. Roth,** whom Mr. Pollock succeeds, has been transferred to the company's main works in West Allis, Wis.

—o—

Otto Gminder, manager of sales, structural shapes, Bethlehem Steel Co., Bethlehem, Pa., has retired, after 40 years service with the company. He is succeeded by **Francis L. Stephenson,** who has been connected with Bethlehem in various sales capacities.

—o—

George R. Ingersoll has been appointed manager of distributor sales, National Screw & Mfg. Co., Cleveland. He replaces **Harold W. La Ganke** who died recently. Mr. Ingersoll, formerly district sales manager for the Cleveland area, has been associated with the sales department of this company for 22 years.

—o—

Donald S. Hoogstra has been appointed steel buyer for Fisher Body Division of General Motors Corp., Detroit, with offices in the General Motors Bldg. He succeeds the late **W. F. Merten.**

—o—

Carl E. Lyon has resigned as vice president and director of purchasing for Cribber & Sexton Co., Chicago. Mr. Lyon will continue his association with the company in an advisory capacity.

—o—

William C. Moreland has resigned as a member of the board of directors, Jones & Laughlin Steel Corp., Pittsburgh.

—o—

Luke H. Sperry has retired as director of engineering, Hercules Powder Co., Wilmington, Del. He is succeeded by **Ernest S. Wilson,** former chief engineer and **Ray N. Wheelock,** assistant director.

—o—

T. R. Dearden has been appointed chief engineer, Michigan Seamless Tube Co., South Lyons, Mich.

—o—

F. J. Kaib has resigned as secretary treasurer and director, National Roll & Foundry Co., Avonmore, Pa. Mr. Kaib has been actively associated with this company since its organization, more than 37 years ago.

RUDOLPH T. ELSTAD

Elected president, Oliver Iron Mining Co., Duluth, a subsidiary of United States Steel Corp. Noted in STEEL, Dec. 9 issue, p. 80.

OBITUARIES . . .

Carl E. Kramer, 64, vice president in charge of the Cleveland Division, United Screw & Bolt Corp., died at his home in Fairview Village, O., recently. He was one of the founders of the company.

—o—

Arvid Peterson, chief engineer, Centrifugal Pump & Compressor Dept. of De Laval Steam Turbine Co., Trenton, N. J., died recently. He entered the service of De Laval in 1907. He was a charter member of the Engineers Club of Trenton, and a member of the board of directors at De Laval.

—o—

Carl O. Thieme, 50, vice president and works manager, H. Kramer & Co., Chicago, died recently in that city. Widely known as a nonferrous metallurgist, he was chosen by the War Department, in 1945, as a member of a committee which visited the European and Mediterranean theaters of operations to make a survey on battlefield scrap and allied matters.

—o—

George E. Neuberth, 78, died at his residence, Newark, N. J., recently. A pioneer in the ferrous and nonferrous tube industry, he invented the Rock-Rite process for the cold reduction of tubes.

—o—

Richard W. Orthwein, 45, Granite City Steel Co., Granite City, Ill., died Dec. 20. He was district sales manager in the company's St. Louis office.

—o—

S. E. Fairchild Jr., 74, chairman, Cruse-Kemper Co., Ambler, Pa., died Dec. 31.

—o—

John W. Boehne Sr., 90, organizer and officer of the Indiana Stove Works, Evansville, Ind., died recently in his home.

—o—

John Corlett Chandler, 83, died Jan. 1, at the Union Club, his Cleveland residence. He had been retired for the past ten years. As a young man he was with Pickands, Mather & Co. as salesman, and later joined the old Lackawanna Steel Co. which merged with Bethlehem Steel Corp. He remained with that corporation and for many years prior to his retirement he was district representative in the northeastern Ohio area.

—o—

Joseph M. Barrett, 61, head, Barrett Engineers, Cleveland, died at his home Jan. 2. Prior to organizing his own company he was associated with Bailey Meter Co., Cleveland.

—o—

E. H. Cooper, 77, chairman, Fafnir Bearing Co., New Britain, Conn., died Jan. 4 at Daytona Beach, Fla. When the Fafnir company was founded in 1911, he became its first secretary-treasurer and manager, and later became president.

—o—

Howard P. Bly, retired manager, Harris-Seybold Co., Cleveland, died in Delray Beach, Fla., recently.

—o—

Albert I. Brost, 56, treasurer, Brost Pattern & Casting Co., Cleveland, died Jan. 5 in that city.

—o—

John Harsch, 78, president, John Harsch Bronze & Foundry Co., Cleveland, died of a heart attack, Jan. 4. He had been spending the winter at Gulfport, Fla.

—o—

Dr. Collins P. Bliss, 80, dean emeritus, New York University College of Engineering, died recently of a heart attack. He was dean of the College of Engineering from 1930 to 1936. Prior to joining the faculty of New York Univ. in 1896 he was associated with the Gregory Furnace Co., Philadelphia, where he began his career in 1891 and was later with the Globe Iron Works, Cleveland.

—o—

William R. King, after a brief illness, died at his home in Pittsburgh, Dec. 30. Sales manager for the Wm. K. Stamets Co., Pittsburgh, he had been associated with that company for the past thirty years.

—o—

William B. Gold, 66, purchasing agent, Electric Storage Battery Co., Philadelphia, died recently in that city. He had been with the company since 1900.

—o—

Lars C. Thomsen, 74, president, L. C. Thomsen & Sons Mfg. Co., died at his residence, Kenosha, Wis., Dec. 27.

—o—

Louis R. Millar, 69, died recently in Los Angeles. He was sales engineer, Mercury Mfg. Co., Chicago, and had been associated with the company for more than 25 years.

—o—

Samuel Hinchliffe, 58, mechanical engineer, Cleveland Graphite Bronze Co., Cleveland, died at his home recently.

—o—

Harry W. Burr died Dec. 25 at his home, Kenosha, Wis. He began his career with the American Brass Co., at Waterbury, Conn., and in 1923 went to Kenosha and became mechanical supervisor at the American Brass plant.

—o—

Eric Hampden Radford, 71, founder and former president, Radford Steel Works, died recently at Los Angeles. Mr. Radford was a pioneer of the stainless steel industry on the Pacific coast.

—o—

John Geiger, 71, purchasing agent, Kellogg Switchboard & Supply Co., Chicago, was killed recently in an automobile accident in California. He had been associated with the company 46 years.

—o—

Henry A. Squibbs, 66, assistant to vice president of sales, American Steel & Wire Co., Chicago, died Dec. 28 in that city on the eve of his retirement. Associated with the company since 1895, he started as a clerk in the Joliet plant. He became general manager of sales, Chicago, 1929, and assumed his recent position in 1945.

—o—

Frederick G. Adamson, 80, retired founder and treasurer, Stephens-Adamson Mfg. Co., Aurora, Ill., died Dec. 29 in Pasadena, Calif., where he had lived for the past 19 years.

—o—

Arthur F. Wirtz, 46, secretary-treasurer, Atlas Mineral Products Co., Mertztown, Pa., died of a heart attack recently.

—o—

Mrs. William H. Stockham, 83, chairman of the board, Stockham Pipe Fittings Co., Birmingham, died Jan. 1 after a brief illness.

—o—

Roy R. Arnold, 59, division sales manager, Michigan Smelting & Refining Division, and Aluminum Refiners Division, Bohn Aluminum & Brass Corp., Detroit, died recently. He was associated with the corporation for twenty years, and previously had been with the Michigan Smelting & Refining Co.

—o—

Carl E. Wallander, 54, sales engineer and representative in the Cleveland district for Kensington Steel Co., Chicago, died Jan. 7 at his home, Lakewood, O.

—o—

Eugene A. Holmgreen Sr., 82, president, Alamo Iron Works, San Antonio, died at his home Jan. 2.

—o—

Bernard B. Wolff, 80, retired member of the woodworking machinery firm, Berry & Orton Co., Philadelphia, died at his home Jan. 1.

—o—

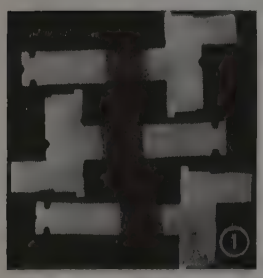
Donald M. Steward, 54, manager, Rednaw Mfg. Co., New York, died Jan. 1 at his home in West Orange, N. J.

—o—

Hoyt D. Griffith, 60, manager of the Springfield, Mass., district of the Westinghouse Electric Corp. since 1931, died Jan. 4 in Springfield.

Induction Hardening OF

Factors determining successful use of induction hardening, problems that arise, and importance of generator power output on the heating rate of steel parts are discussed by the authors in this first article of a series



INDUCTION heating, while not a new process, was widely applied for hardening of steel parts only in recent years. Procedure for induction hardening involves heating the steel part by induced currents to a high temperature, at which the formation of austenite occurs in few seconds, followed by quenching to transform the austenite to martensite.

The short austenitization period is one of two main distinguishing features between induction hardening and the conventional furnace hardening, where minutes or hours are allowed for austenitization. Second important feature of induction heating is the phenomenon of skin-heating by virtue of which the surface of the sample is heated to a greater extent than the core. This makes it possible to surface-harden steel parts without carburizing them first.

Physical requirements for induction heating are not complicated. Besides the metal sample to be heated, a heating coil or inductor block, and a source of alternating current are required. Arrangement of heating coil and quench-ring are shown in Fig. 2. The high-frequency current passing through the heating coil produces a fluctuating magnetic field. This in turn induces an electromotive force in the metal sample. Since the induced electromotive force is acting on a closed electric circuit, a current flows in the sample. Heating effect results from the I^2R loss due to flow of alternating current in the sample. In magnetic materials there is also a small amount of heating due to the magnetic hysteresis effect. The steel sample is heated by these combined heating effects to temperatures where austenite forms readily, 1350-1800° F. When quenched, the austenite in turn will transform to martensite to complete the hardening cycle. Note Fig. 3.

Understanding of main factors that influence induction hardening results—frequency, power, coil design, quenching fixture and metallurgical response—as well as of the process itself results in better utilization of equipment and appreciation of potentialities.

Phenomenon of current induction, basis of induction heating, was discovered independently in 1831 by Faraday in England, and Henry in America. Practical value of using induced currents to heat metals, however, was not realized until 1887, when E. A. Colby filed an application for a patent for induction melting, thus pointing the way for modern practice.

Progress was slow, and it was not until 1917 that commercial use was made of induction heating for melting brass and platinum. This advance was related, in a great degree, to the work of Dr. E. F. Northrup of Ajax Electrothermic Corp. Commercial development of induction heating was confined primarily to melting of metals until the middle 1930's, when application of the process was made to the selective surface hardening of steel crank shafts by Ohio Crankshaft Co., and for internal hardening of wheel-hubs by Budd Wheel Co. Wide application was made of this useful metallurgical tool for localized and surface hardening steel parts.

Advancement of induction heating methods during the last decade was related to a large extent to improvements in alternating-current generators. Today, three types of commercial equipment, covering a wide range of power output and frequency ratings, are available. The three sources of "high frequency" power, "high frequency" covering the range of 1000 to 15,000,000 cycles per second, are:

(1) Motor generators covering frequency range up to approximately 10,000 cycles per second, at power output ratings up to 1200 kw. This equipment is particularly suited for hardening large sections of steel.

(2) Spark-gap oscillators providing frequencies of 100 to 400 kilocycles per second at power input ratings up to 50 kw.

(3) Vacuum-tube oscillators are manufactured to produce alternating currents with frequencies 100 to 1000 kilocycles per second, or higher if desired, at power output ratings up to 200 kw.

All three types of equipment are in general use. Suitability of each for any particular job depends upon several factors including size of part, power requirement, metallurgical results desired and relative cost.

Induction heating is particularly suited for surface hardening or localized hardening of steel parts. Two examples of surface hardening are shown in Figs. 6 and 7. These are typical of numerous parts that require a hard, wear-resisting surface and a tough unhardened core, and which are hardened satisfactorily by induction methods. Samples shown in Figs. 1 and 8 illustrate localized hardening in parts which preferential areas are hardened completely through the cross section. There are other heat treating problems in which surface and localized hardening are combined, for example, hardening of teeth on the rotor shaft shown in Fig. 4.

By DR. D. L. MARTIN
Metallurgist
Research Laboratory
and
R. A. GEHR
Application Engineer
Industrial Heating Engineering Div.
General Electric Co.
Schenectady, N. Y.

STEEL

Examples in Figs. 1, 4, 6, 7 and 8 are typical of the type of application for which induction hardening may be used. Induction heating methods become economical by virtue of one or more of the following advantages:

(1) It is possible to case-harden internal as well as external surfaces of steel parts. In fact, internal hardening of wheel-hubs and cylinder liners is a unique application of induction hardening which yields excellent results.

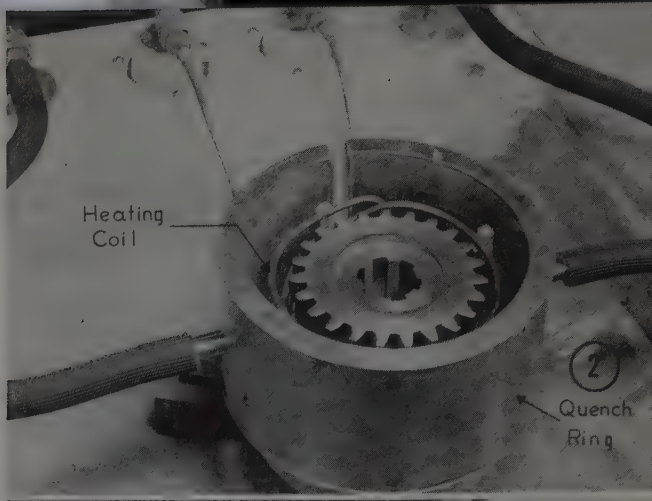
(2) Heating zone is confined by size and shape of coil. This permits hardening of selective areas. An attractive application of selective heating is hardening of localized sections of assembled or fabricated parts as illustrated in Fig. 7, where teeth are machined and hardened after the cast rotor was pressed on the steel shaft.

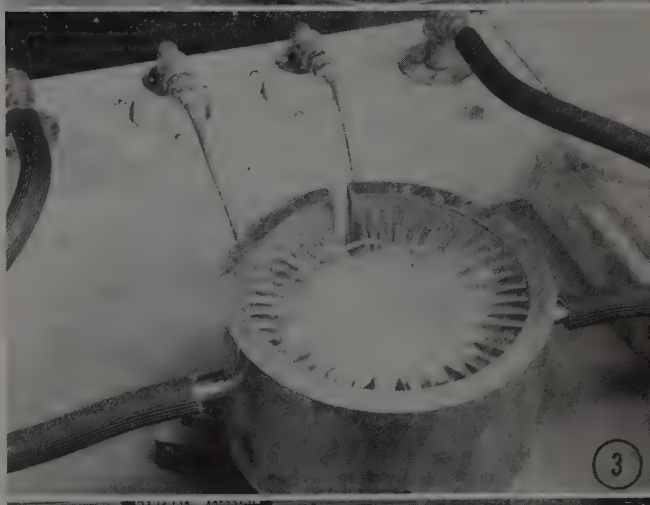
(3) Efficiency of heat utilization is high, since heat can be localized in the portion to be hardened. In furnace heating, it is more difficult to limit the volume of metal to be heated.

(4) Heating and quenching cycles can be controlled automatically after correct procedure is established. In addition to automatic timing of the heating and cooling cycles, it is possible to use automatic handling equipment that loads the heating coil with steel parts, and then unloads the coil after the parts are hardened.

(5) Equipment is simple to operate. For hand-operation, operator pushes a button to start the heating and presses another button to turn the current off and start the water quenching. For semiautomatic or automatic operation, operators' tasks are confined to loading a conveyor belt or feed hopper.

(6) Equipment also is ready for immediate operation at the start of each working day. This is advan-





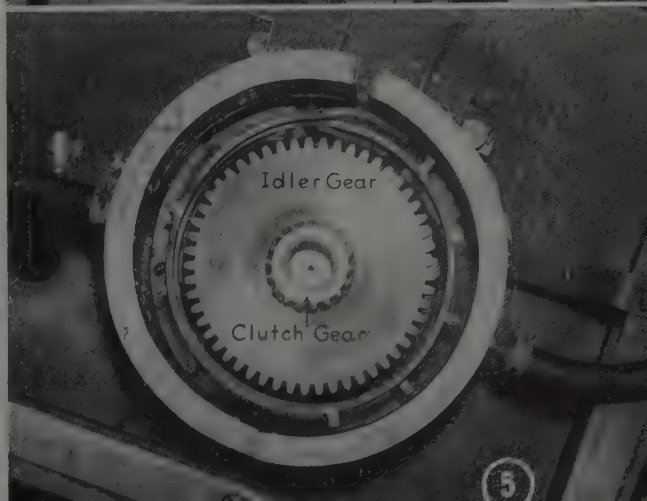


Fig. 1—Localized-hardened small crankshaft. To confine heat in desired area, part was heated under water

Fig. 2—Induction-hardening fixture for surface hardening a cluster gear

Fig. 3—Spray-quenching cluster gear after induction heating

Fig. 4—View of motor-operated fixture for hardening teeth on rotor shaft. Example of hardening a section of an assembled part

Fig. 5—Idler gear with pressed-in clutch gear

tageous where a plant operates 8 hours per day. The induction heater is ready for production each morning; whereas a furnace must first be heated, unless the heat was left on over night. This, however, also dissipates useful energy.

(7) Rate of production with induction heating is high, because of the short heating and quenching cycles. For large parts that require a relatively long heating and quenching cycle, that is, about 1 min, the rate is about 60 per hour per machine. However, for hardening small parts such as pins (⅝-in. diameter by 1 in.) equipment is available to harden them at a rate of 3600 per hour. Production of some parts at a rate of 10,000 per hour is possible, if samples are loaded on a moving belt that carries them past the heating coil.

(8) It is possible to final-machine many parts at the time when they are most easily machined, before hardening, and thus reduce grinding costs on the hardened part. Distortion and oxidation are minimized by the uniform and rapid heating. For example, one machine tool manufacturer reports a saving of $1.70 per gear

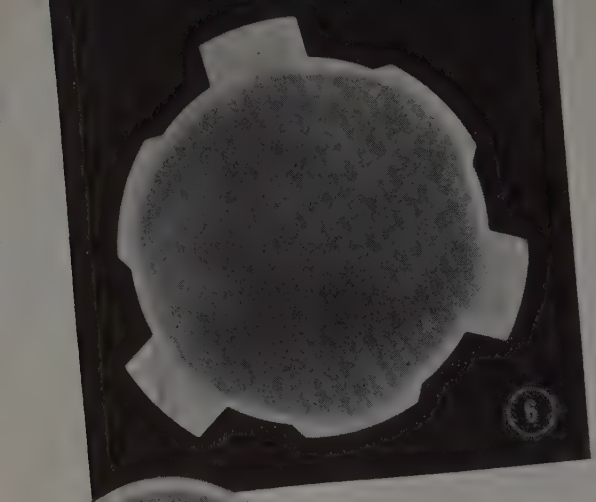


Fig. 6—Section of surface-induction-hardened shaft. Sample, about 2 in. in diameter and 6 ft long, was hardened by passing it slowly through single-turn heating coil carrying 530 kc current

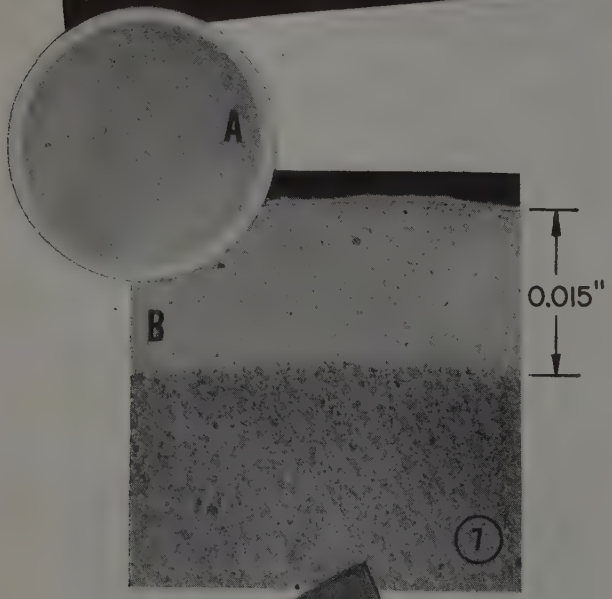


Fig. 7—Section of progressively hardened shaft of SAE 1350 steel. Micrograph in B is enlarged view of the martensitic zone. This ½-in. shaft was hardened with 530 kc current at a high-power concentration of 130 kw per square inch. Note how effective chromium plate at edge is in preventing rounding of surface during polishing

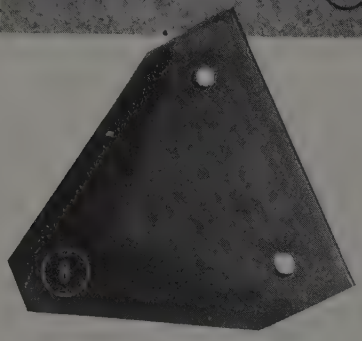


Fig. 8—Localized-hardened mowing machine cutter blade. Production of this cutter per machine was 3600 per hour

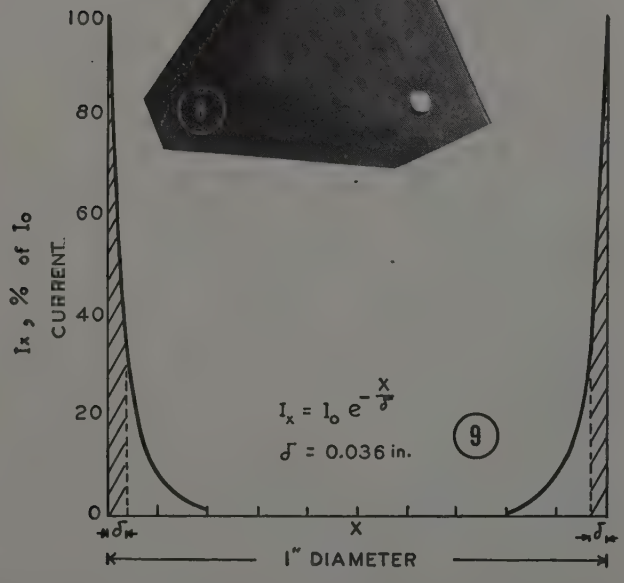
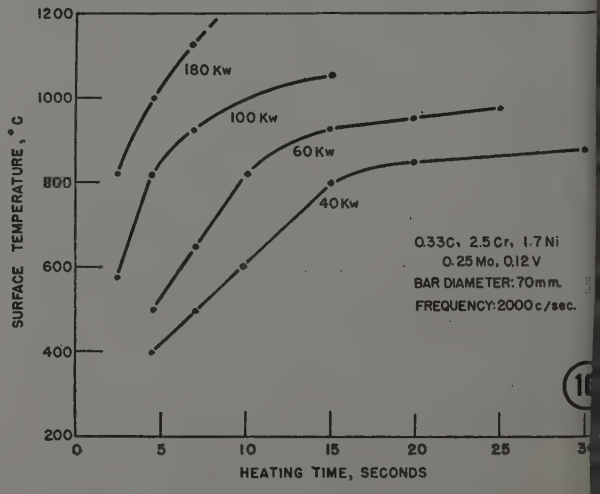


Fig. 9—Variation in induced current over cross section of an SAE 1045 steel bar at 850° C. Data used to calculate were obtained from an article by Vologdin[4]

Fig. 10—Effect of increasing power on the heating curve (After Seulen and Voss[3])

Fig. 11—Comparison of effect of frequency on depth of penetration of current in several materials

Fig. 12—Comparison of effect of increasing power on the temperature distribution curve (After Seulen and Voss[3])



after changing to the induction hardening method. The assembly in this case consisted of a large idler gear (6⅞-in. by ⅞-in. face) with a pressed-in clutch gear (Fig. 5).

Furthermore, this manufacturer stated, "In addition to the actual savings, we are obtaining a more accurate gear."

(9) For many applications it is possible to substitute alloy steels with plain carbon steels, without impairing physical properties.

(10) The life of induction hardened crankshafts, gears, and many other parts is reported to be equal to or, in some cases, better than that obtained by other methods of hardening. Certainly, it is possible to obtain more satisfactory properties. For example, life test on induction hardened starter ring gears demonstrated that they will withstand four times the number of starts expected in the normal life of an automobile. However, *caution is necessary, since it is also possible to incorrectly harden parts,* and thus shorten the service.

(11) Working conditions around the induction heating equipment are clean and cool.

(12) Heating equipment can be used for a variety of heat treating problems in addition to hardening: Brazing, annealing, welding, and melting.

(13) Results not easily obtained by other hardening methods are produced by induction methods. For example, long steel rails or shafts, Fig. 6, are easily surface hardened by progressive induction hardening, and it would be difficult to accomplish the same results with other methods, except flame hardening.

In view of these advantages it is understandable why induction hardening has a promising future. It is not a cure-all for every heat treating problem, and there are many jobs in which it cannot compete, generally for economic reasons, with established methods. Among its limitations are:

(1) Parts requiring complete hardening are at times not suited for induction hardening because of the higher cost of energy.

(2) Very thin or extra large pieces present difficulties in hardening, because of limitations in the frequency and power ratings of electrical equipment available.

(3) Edges and corners of specimens heat faster. This complicates the problem of contour-hardening in gears and similar parts.

(4) Heating and quenching cycles may be critical for consistent results. The limitation is in the automatic timing equipment and not in the induction heater. Accurate timing equipment is available for the special jobs that require automatic timing to within a small fraction of a second. However, the equipment is limited to special applications.

(5) Maintenance of electrical equipment requires the attention of trained personnel.

(6) Heating and quenching cycles for each hardening problem is usually esablished by trial and error methods, preferably under the supervision of a metallurgist.

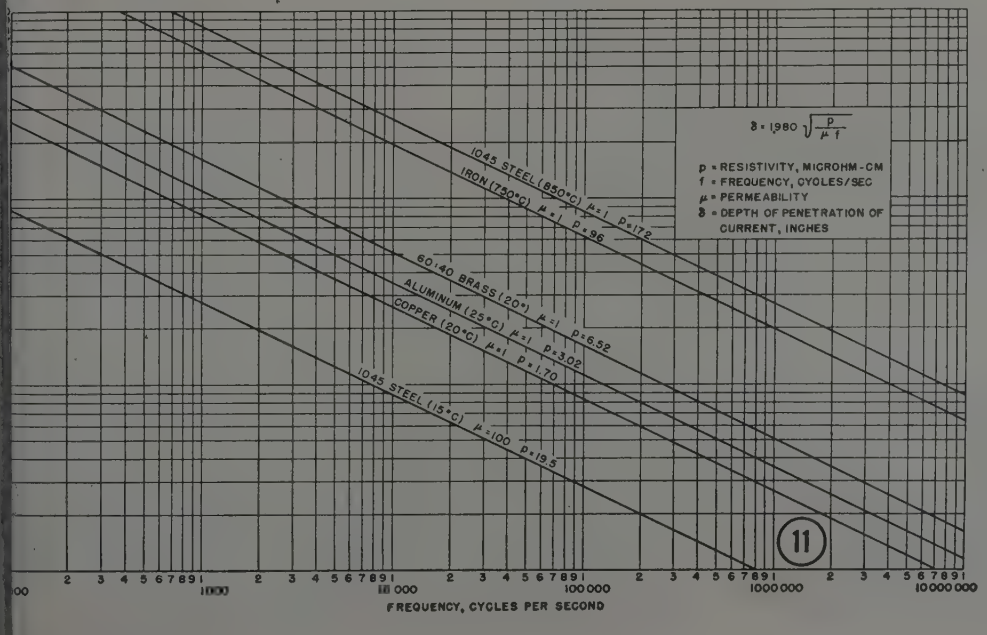
(7) For some applications, attention must be given to the composition and structure of the part being heated. This may require closer control of the specifications of the steels used for induction hardening.

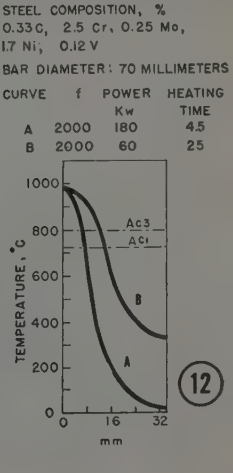
Successful hardening of steel by induction methods will depend upon four main factors, the electrical characteristics of the high frequency equipment, the design of the heating coil, the design of the quenching fixture and metallurgical response of the steel. Problems which may arise in applying induction methods of hardening to commercial applications are likely to be related to one or more of the above factors. Some of the difficulties which may be encountered are:

(a) Incomplete austenitization, that is, the presence of ferrite or carbides in the hardened zone.

(b) Depth of martensitic zone is either too shallow or too deep.

(c) Depth of martensitic zone is not uniform across the face of the sample. This is likely to be a problem in irregular surfaces. (*Please turn to Page* 114)


δ = 1,980 √(ρ/μf)
ρ = RESISTIVITY, MICROHM-CM
f = FREQUENCY, CYCLES/SEC
μ = PERMEABILITY
δ = DEPTH OF PENETRATION OF CURRENT, INCHES
1045 STEEL (850°C) μ=1 ρ=172
IRON (750°C) μ=1 ρ=96
60-40 BRASS (20°) μ=1 ρ=6.52
ALUMINUM (25°C) μ=1 ρ=3.02
COPPER (20°C) μ=1 ρ=1.70
1045 STEEL (15°C) μ=100 ρ=19.5
11
FREQUENCY, CYCLES PER SECOND



Control and Measurement of Surface Finishes

. . . a challenge to industry. Great need at present is for a universal reference standard for surface finishes

GREAT opportunities now exist for the future improvement of surface finish measurement instrumentation since none of the existing instruments for the purpose are completely satisfactory. Even greater opportunities exist for those who increase the utilization of existing instrumentation in controlling the surface quality of products whose performance depends upon proper surface finish. These were emphasized at the September conference of the Instrument Society of America, Pittsburgh.

Surface quality control today lags far behind existing instrumentation primarily because there are so many men now in industry who do not realize that this instrumentation is no longer a laboratory curiosity but has grown up to the point where it can offer real and tangible help in all machine shops, instrument laboratories or wherever any machine work is done. The particular instrumentation needed will depend largely upon the type of work done. An attempt will be made here to give some ideas that will assist in making the proper selection.

In some industries, where mass production and interchangeable manufacture have made it necessary, dimensional limits have had to be imposed so that mating parts could be assembled easily and accurately and so that spare parts that would fit could be supplied to distant customers. Now there are literally thousands of different types of instruments and gages for controlling the dimensional tolerances of these parts as well as the composition and physical properties of the materials from which they are fabricated. Great progress has been made.

Before equal progress can be made in controlling the surface quality of machined parts it will be necessary that men of responsibility in industry come to the realization that surface finish measurement instrumentation can be brought out of the laboratory. It can take its place on the production line or in the (*Please turn to Page* 116)

By JAMES A. BROADSTON
Design Engineer
North American Aviation, Inc.
and Chief Engineer
Surface Checking Gage Co.
Los Angeles

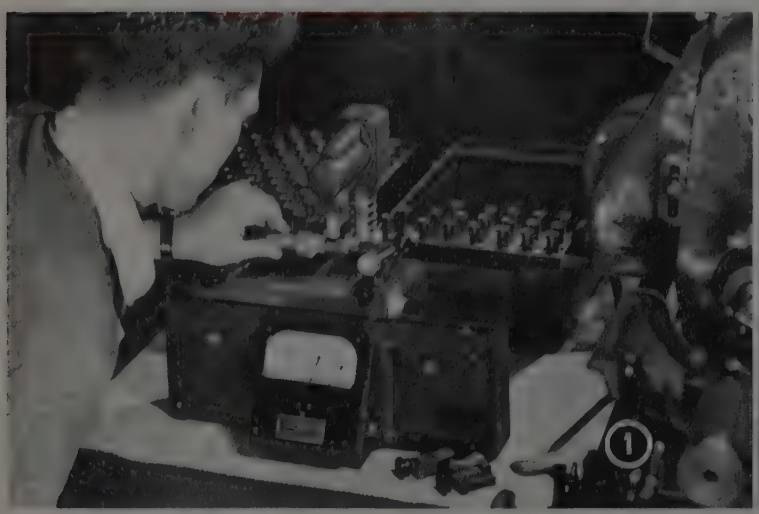
Fig. 1—The surface comparator manufactured by Comtor Co. is the light reflection type of instrument

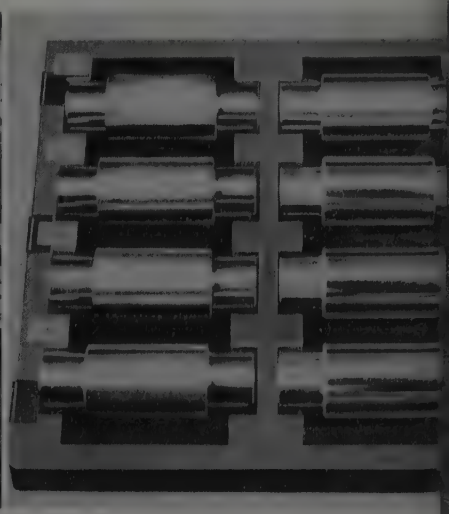
Fig. 2—Ground steel specimens made by Norton Co. are actual machined samples depicting various grinding finishes

Fig. 3—Surface roughness standards developed by Surface Checking Gage Co. indicate types of surfaces left by various machining methods. These replica standards are employed as are those of Fig. 4

Fig. 4—Standard surface roughness specimens for finger-nail actual comparison are made in a convenient form by N. H. Gage Co.

Fig. 5—The tracer point type of instrument such as the one made by Brush Development Co. is best suited for controlling very fine surfaces





SURE-FIRE
3
4
5

In this article, the author suggests some applications and advantages of abrasive belts. Previous stories, describing the manufacture of abrasive wheels, use of compounds, supplementary equipment and machines for buffing and polishing, appeared in the 1946 issues of STEEL, Dec. 9, 16, 23 and 30 respectively

By JOHN E. HYLER

USING ABRASIVE BELTS FOR Buffing and Polishing

MANY operations can be carried out advantageously with polishing belts. There are several methods by which such belts are applied. Abrasive belts with leather or canvas base are extensively used, being supplied in many cases by manufacturers of transmission belting.

One method of setting up belts with abrasive grain is to make a paste of the grain and glue solution. Put in as much abrasive as possible, at the same time leaving the paste sufficiently workable to permit spreading with knife, brush or small trowel. Another method is to paint the belt with glue solution, and then sift on abrasive. With fine grains, simply sprinkling abrasive into the coating of glue solution will suffice. Coarse grains should be gone over with a roller to embed them firmly into the painted on glue and also into the surface of the belt.

Regardless of how glue and abrasive are applied, coated belts should be dried under conditions similar to those desirable for drying setup polishing wheels. Where belts are to be set up with relatively coarse abrasive grains it is customary to give them a preliminary sizing coat of thin glue solution, using seven or eight parts water to one of glue. Allow this to dry before applying setting-up coat of glue. When glue and abrasive grains are mixed to form a belt coating paste, this mixture must be kept thoroughly stirred and uniform throughout the mass to insure uniform coating.

Endless abrasive polishing belts in many cases are made up by joining the ends of long strips of abrasive cloth.

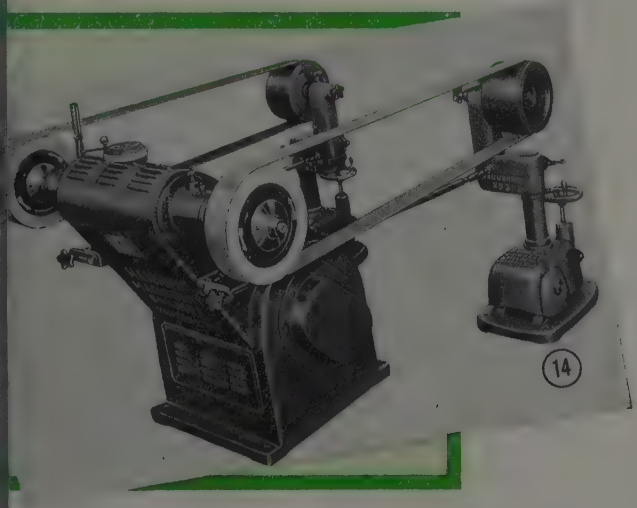
Fig. 13—Wheel stand shown here has only one backstand idler applied. The two pulleys on the idler column train abrasive belt through a triangular path, allowing belts of greater lengths to be used in less floor space

Fig. 14 — Variable speed type wheel stand has facilities for tracking belts on pulleys. Photos courtesy Hammond Machinery Builders Inc.

Cutting dies are available for making scalloped splicing cuts on the ends of strips. Coated cloth is furnished by manufacturers of abrasive products in whatever grits are proper for any given finish.

Belts of this kind are used widely in both metal and woodworking industries and numerous machines have been developed for their use. The smaller standard abrasive belt surfacing and polishing machines carry belts only 4 in. wide; large ones carry belts as wide as 20 in. Special machines for polishing sheets run to much greater width. Some are designed so that belt runs over a flat platen so that any flat surface of limited area, pressed against the running face of the belt above the platen, is polished and truly flattened, all in one operation. Vacuum cleaner bags are attached to exhaust connections on many of these units. The two pulleys over which the belt runs are carried on a tilting frame so that the surface of the running belt can be set horizontally, vertically or at any intermediate angle—as best suits the work.

Die-casters find these belt machines especially useful



for finishing and polishing. Also they are particularly well adapted for finishing, finning and surfacing plastic parts. Aluminum oxide coated belts are used for metal finishing.

Recent developments allow polishing belts to be used wet. To make this possible plastic bond for holding abrasive to belt has been perfected. In addition to eliminating frictional heat, with consequent discoloring and warping of work, a wet belt eliminates flying dust and grit. Not only is this wet belt process useful on all kinds of metals, but it also works to great advantage when smoothing and polishing bone, slate, plastics, marble, hard rubber, fiber, ceramics, glass, tile—in fact practically all commonly used rigid materials.

Coolant, water or some compound, is sprayed on the surface of the belt at a point just before its engagement with the work. Immediately beyond the work it is flushed again to remove all cuttings, which must not be allowed to "ride around" between belt and work.

Sometimes these machines are connected directly to the plant water line and to a drain. More satisfactory however is the self-contained unit in which coolant is recirculated from a reservoir which is equipped with settling tanks to trap grit and cuttings. Valuable materials sometimes can be reclaimed from this sludge.

Aside from their coolant provisions, these "wet" machines are very much like the dry belt grinders—including platen arrangement for generating flat surfaces.

Portable types of belt polishing and finishing machines, and operated like a carpenter's plane, find many applications where tool should come to the work rather than work coming to the tool. Metal, wood, plastic, marble and ceramics are among the materials effecively smoothed and polished with them. Most manufacturers provide vacuum dust collectors for use with these tools. Five different types of belts ordinarily are available, together with specific recommendations from their makers as to where and how to use them. Belts for polishing metals are aluminous oxide coated, while those for marble, slate and similar materials carry silicon carbide abrasive.

Backstand Idlers: Abrasive belts can be employed in connection with ordinary polishing and buffing jacks or stands. This involves use of a special band wheel or pulley on the polishing stand arbor, in place of the buff or other "working" wheel, and also requires a so-called backstand idler behind the polishing stand. This backstand idler consists of a balanced ball bearing pulley, carried on a column attached to a floor base. Driving power is furnished by the polishing stand, the endless abrasive band simply "belting together" the special wheel on the power driven polishing stand arbor and the free-running pulley on the backstand idler.

A backstand idler, with a proper selection of abrasive belts, makes any polishing and buffing stand more productive and versatile. At the same time it interferes in no way with its use in connection with any of the regular types of buffs and polishing wheels. The abrasive belt simply is removed from its pulleys and an ordinary "working" wheel is substituted for the belt pulley on the polishing stand arbor. The backstand idler stands far enough away that it in no way interferes with steel polishing operations.

Obviously, one pass of a belt with backstand idler represents much greater length of abrasive surface than is by one revolution of a wheel. This means that a considerably greater length of time elapses at any given speed of the machine, while the belt is making a full pass, than is true of the periphery of a wheel. Thus the belt affords proportionately greater cooling time for its abrasive surface, with consequent cooler cutting.

Manufacturers of polishing wheels have developed what they call "tractor wheels" for use on the arbors of polishing stands in connection with belts and backstand idlers. These wheels are made of tough material, are designed for hard wear and provide desirable cushioning action at the point where the work is applied to the belt. They are made in three different densities. One density is suitable with belts carrying abrasive grains from No. 36 to 60; another with abrasive grains from 60 down to 200 grain, and the third for grains finer than 200.

Another interesting type of contact wheel has been developed by one of the manufacturers of abrasive cloth and backstand abrasive belts. Its face is divided into small segments. Each of these segments work independently, (*Please turn to Page* 109)

Seen and Heard in the Machinery Field

By GUY HUBBARD
Machine Tool Editor

FELLOWS' FIFTIETH: One of my earliest recollections of the machine tool industry is that of seeing a square wooden building—not much larger than a fair-sized bandstand. It had sprung up on the southwest side of turbulent Black River, at the upper end of the village of Springfield, Vermont.

That—so somebody in the old family carry-all remarked—was a new shop called the Fellows Gear Shaper Co. I happen to be able to date that by the circumstances that everyone was saying "Remember the Maine!"; that fife-and-drum corps were playing a tune called "There'll Be a Hot Time in the Old Town Tonight"; and because the son of one of our neighbors appeared in a dark blue uniform, went to a place called Chicamauga, and never came back alive.

It hardly seems possible, but it is a fact that the Fellows Gear Shaper Co. has just celebrated its 50th anniversary. Edwin R. Fellows, the inventive and industrial genius who founded this company late in the year 1896, did not live quite long enough to see his enterprise round out its first half century. Born in Torrington, Conn., May 29, 1865, he died at his home in Springfield, Vermont on May 21, 1945—active up to the last day of his long and useful life.

I never knew anyone in the machine tool business who was any more self-effacing than was Mr. Fellows. He was a wonderful person to meet—but he just didn't care to talk about himself. As a matter of fact, his was one of the few basic inventions in the history of machine tools. Not only that, but noted theorists of 50 years ago proved to Mr. Fellows that his ideas were wholly impractical.

Nevertheless, he got his patents, had the first machine and cutters ready for the market in the spring of 1897, and in 1899 received the John Scott Medal for his "machine and cutter for generating gear teeth"—this on the recommendation of the famous Franklin Institute in Philadelphia. That just goes to show how wrong "noted theorists" sometimes are.

About that same time they also were busy proving that no heavier-than-air machine capable of carrying a man, could fly. Within two decades a lot of those machines "that couldn't cut gears" were very busy making gears for the engines of those other "machines that couldn't fly". It is indeed a real tribute to individual initiative that Mr. Fellows didn't let a misplaced decimal point stop him back in 1896.

As things turned out, he lived to see his little shop grow to be one of the largest plants in the world engaged in the manufacturing of equipment for cutting, finishing and checking gears. He saw his working force grow from seven men to several thousand people. And they have much better jobs than people ordinarily do have in a country town like Springfield, Vermont. Can any of our "economic theorists" better that record?

PRECISION HOLE LOCATION: Something new has been added to the none too plentiful literature dealing with modern tool engineering and interchangeable manufacturing technique. It is a decidedly worthwhile addition to such literature. It is a beautifully gotten up volume of 448 pages entitled, "Precision Hole Location for Interchangeability in Toolmaking and Production". It has just been published by Moore Special Tool Co., Bridgeport, Conn. The price of this book is $3.00 within the U. S. A., $3.50 elsewhere. It is the finest package of concentrated "know how" I have seen for many a long day.

One of the reasons why there has been something of a dearth of high grade, highly specialized books on metalworking and machine shop practice is that such books require sponsorship as well as authorship. What can be accomplished through capable authorship has been forcefully demonstrated within the past few years by the widely read and tremendously influential text books published by such organizations as the Lincoln Electric Co. and the Warner & Swasey Co. This Moore-sponsored book is in the class with those just mentioned.

There is lot more to this business of "hole making" than most people realize. James Watt encountered serious difficulties with it back in 1775 when he undertook to manufacture his first steam engines. A "tool engineer" named John Wilkinson came to Watt's rescue with a machine which bored cylinders so that "They did not err the thickness of an old shilling in any part".

What was good enough for James Watt, however, was not nearly good enough for Eli Whitney and Eli Terry and Seth Thomas and other founders of interchangeable manufacturing here in America. Their work had to be to "thousandths", even though they did not dimension it in that manner. Then about the time of World War I, hole specifications to "tenths" began to appear. Now commercial hole dimensioning is done in "millionths."

Suffice it to say that with the advent of "millionths" expedients formerly used no longer are practical. New and scientific ways and means have had to be devised for accomplishing exact (and repetitive) location, generation and finishing of round holes. This modern technique involves precision machine spacing and sizing.

These new and scientific ways and means primarily are what this book is concerned with. It goes into the history of the old methods merely as a prelude to a complete, beautifully illustrated exposition of successful and profitable applications of the modern ways and means to a wide variety of tool, die and production operations demanding precision hole location and finishing.

My good friend, J. Robert Moore, author of this book, has profound, first-hand knowledge of these subjects. He has writing ability. He has stick-to-it-ive-ness—and how one needs that throughout the months-long, "pants-to-chair" ordeal of such a job of technical writing!

Beyond all that he had as sponsor his older brother, Richard Moore, who went at this book-building job just as he goes at the building of a high grade set of dies or a precision machine tool.

Induction Soldering

STAINLESS STEEL KITCHEN UTENSILS

INDUCTION heating applied to soldering stainless steel kitchen utensils resulted in increased production, reduction of labor costs and improvement in product quality at Adel Precision Products Corp., Huntington, W. Va. Equipped with a 20 kw, 450 kc R-F generator, the production line turns out 1500 sets composed of six stainless items in a 15-hour day.

Ten women and two men form the line. Shanks formed in another part of the plant are first inspected at the start of the finishing table and placed in a frame. As they pass from one operator to the next, a slotted ferrule is placed on one end of each shank, followed by a wire ring of silver solder inserted at the interior joint of ferrule and shank. A small amount of flux is then added where solder and ferrule meet the shank.

Pieces finished to this point are placed in their frame under induction heat to join together the ferrule and shank. The coil used for this operation is a multiple of 12 single turns in series. After completing the 15 sec heating cycle of 1250° F to give the joint the required tensile strength, pieces are removed from the frame and rinsed in a special alkali cleansing bath. They are then sent to another factory where plastic handles are fitted around the upper shank and into ferrule at 4500 lb pressure.

Upon return to the manufacturer shanks are placed in another frame along with the blade of the utensil being made. Flux is painted on spot where blade and shank are to be joined. A narrow strip of silver solder is then placed in its proper position on back of blade. Flux is also painted on beveled end of shank and the frames are locked.

For the last heating process, a unit of four coils in series is used. Each coil is made in approximately three quarters of a turn. The prepared frame is placed very close to these coils, and a heating cycle of 12 sec is applied to seal the joints. The finished utensils are then released from the frame and rinsed in a hot alkali cleaning solution—same as is used in preparing the shank and ferrule for the plastic handle. When the units have cooled, polishing is accomplished by holding the tools against a motor-driven polishing wheel.

According to engineers of Westinghouse Electric Corp., Pittsburgh, power input for full generator output is 43 kva, 3 phase, 60 cycle, at 95 per cent power factor. Control is by means of a "start-stop" (*Please turn to Page* 112)

Fig. 1 (*above*)—*Ring of silver solder, and suitable flux, is placed on shanks before soldering operation which is done with a coil composed of* 12 *single turns in series*

Fig. 2 (*right*)—*Shank and blade are joined in approximately* 12 *sec using a* 4-*turn series coil*

Pressure —

By CHARLES J. BURCH
The Linde Air Products Co.
New York
and
ARNOLD L. RUSTAY
ALAN CROWELL
STEPHEN M. JABLONSKI
Wyman-Gordon Co.
Worcester, Mass.

This is a progress report on the application of pressure-welding to the production of stainless steel rings ranging in sizes up to 20 in. in diameter with cross-sections from 1½ to 4½ square inches. Close control of surface preparation, end pressure, and rate of heating essential

THE pressure-welding process has been investigated by the authors to see whether or not it would be applicable to the production of stainless steel rings up to 20 in. in diameter for use in the aircraft industry. As will be shown, welded rings can be produced satisfactorily but the process must be evaluated carefully in comparison with other fabricating methods to choose the most economical method.

Several methods of producing the rings were considered. The first method, one that is commonly used, consists of making seamless ring by piercing an appropriate disk and then rolling on a mandrel to the rough dimensions of the part required. This method produces parts with excellent properties but may require considerable manipulation for large rings and is, for the most part, limited to parts of relatively simple cross section such as squares or rectangles. However, these simple shapes can, in a subsequent operation, be die-forged to produce fairly complicated contours.

The second commonly used method consists of upsetting a round or square on flat dies to produce a disk of the desired diameter, then die-forging the disk to shape. This method requires that the stock be amenable to upsetting to proper diameter and thickness without excessive cracking. Usually 20 to 60 per cent of the metal is wasted because of the necessity of a large center punchout.

The third method of producing the rings, used principally for rings of fairly thin cross section, consists of flash-welding appropriately prepared stock to produce the ring. This ring may then be subsequently forged in dies to produce the desired shape. A modification of this process consists of rolling the ring to the desired size and then welding, by means of standard hand methods, to produce a piece which can be forged in dies to the proper shape.

Based on our experience, it was evident that the first two methods would produce parts with maximum mechanical properties throughout the ring. The pressure-welding method involves the joining of two semicircular halves by two diametrically opposite pressure welds.

The sequence of steps in making a typical ring is shown in Fig. 1. Our experience with pressure-welding medium alloy steels, such as SAE 4340, had indicated that if the pressure-welding process could be adapted to the manufacture of stainless steel rings it might have production advantages. Induction heating and gas heating are alternate methods that may be used to bring the weld zone to temperature. This article is confined to a description of the work using the oxyacetylene flame as a source

Fig. 1—Sequence of manufacture: (A) Bent half rings with surfaces prepared for welding. (B) Welded ring with upset bead removed and etched for inspection. (C) Ring die forged to proper size and contour

Fig. 2—Pressure welds in ⅞-in. section of Type 347 stainless steel: (Top) as welded; (bottom) forged

Fig. 3—Weld is horizontal through center in this photomicrograph of Type 347 after forging and solution treatment

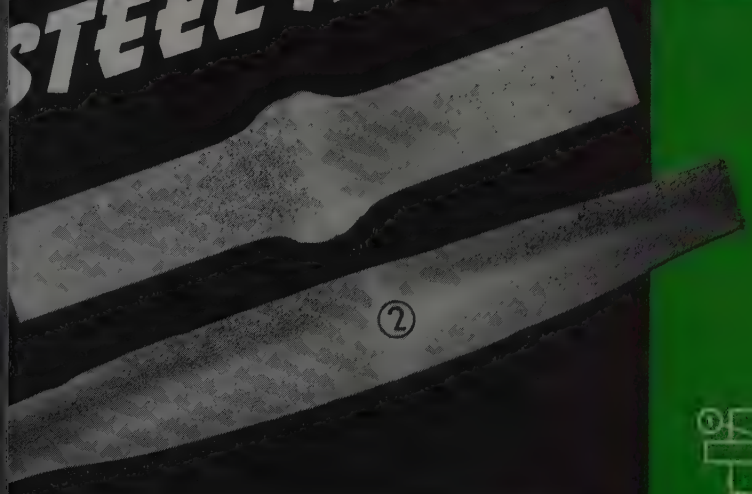
Fig. 4—Deposited oxides are present at weld interface of Type 321 after solution treatment

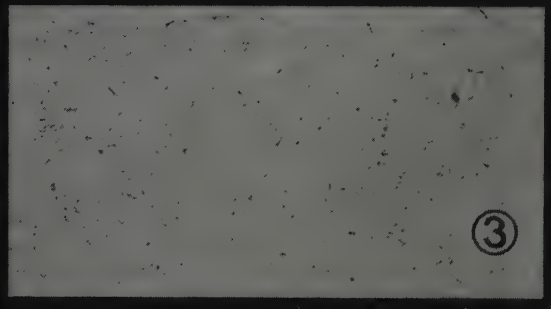
Fig. 5—Curves showing time, temperature and pressure relationship in one section

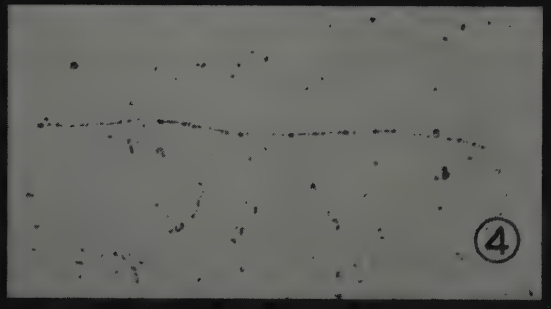
Fig. 6—Diagram showing effect of compensating grind

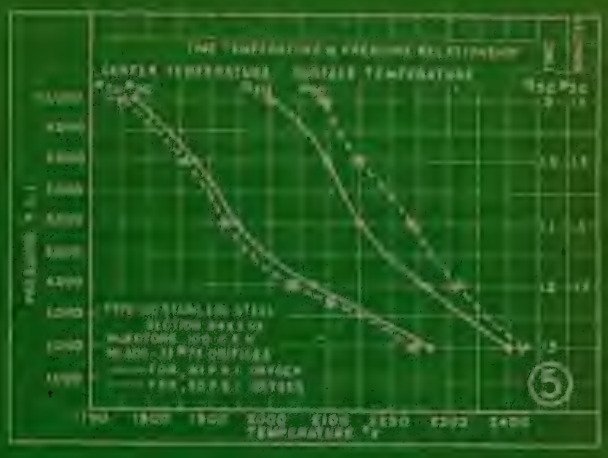
Fig. 7—Equipment required for pressure-welding rings

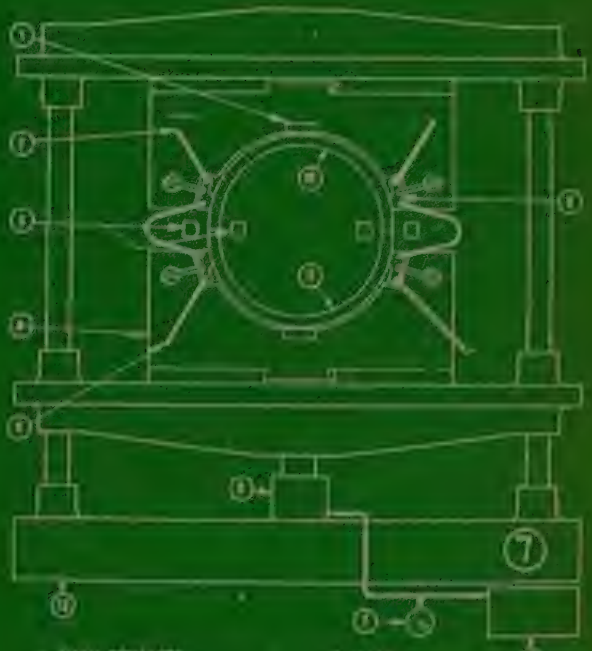
Welding STAINLESS STEEL RINGS











of heat with varying arrangements.

One of the prime considerations in choosing pressure-welding was the fact quantities of a given size were not large, so that die cost and equipment cost would be an important item in the total production cost of each ring. The other important consideration was that at the time this work was begun type 347 stainless steel, containing columbium, was not available. Type 321, containing titanium, had to be used.

This titanium stainless steel has a greater tendency to crack around the periphery of disk forgings than type 347. Thus the grinding that would probably be necessary in producing these rings as forgings would have to be weighed against the processing expenses of the welding method. Types and analyses of the steels used are given in Table I.

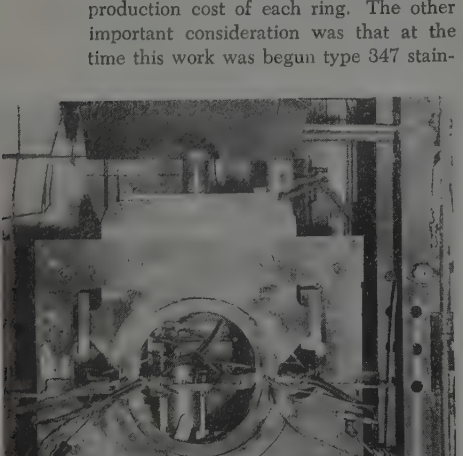
Preliminary Work To Establish Welding Technique: At the cutset of the program it was decided that the best way to evaluate weld quality for this type of application was to forge pressure-welded test sections. Experimental pressure welds were made until the technique was developed to the point where the test welds could be hammer-forged without cracking and until the mechanical properties through the welds were satisfactory.

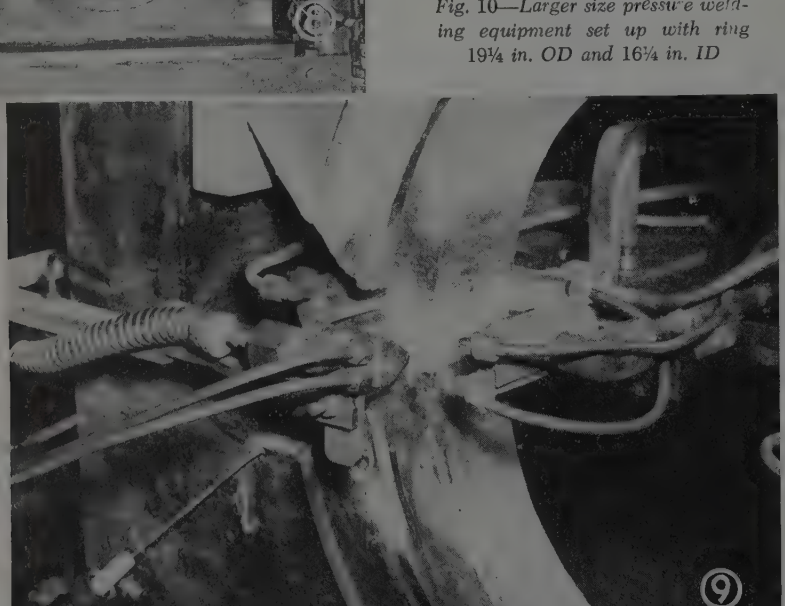
The first test specimens, of 18-8 stainless steel, type 347, ⅞-in. thick and 3-in. wide, were pressure-welded and upsets were machined off. They were then forged to reduce the 3-in. dimension to ¾-in., a reduction of 4 to 1. The welds had not altered the forgeability of the steel, and the test specimens forged satisfactorily without splitting or rupturing at the weld. The specimens were tested both after welding and after forging. Hot acid etched sections showing the soundness of the weld are shown in Fig. 2.

Tensile tests taken through the welds indicated that properties through the best welds were equivalent to those of original bar material. Evidence of weld interface was present on the pieces after welding. This interface was not visible on sections taken through welds that had been forged, as shown in Fig. 3. Apparently the forging action or the solution treatment during heating for forging has broken up the continuity of the oxide or carbide particles present at the original weld interface.

Pressure welds were next made for forging tests on straight 6-in lengths in the various section sizes contemplated for rings, as listed in Table II. The quality of the welds was not consistent, even though the welds had apparently been made in the same manner. Welds made on 1 x 3 in. sections of stainless steel failed at the weld by splitting during forging. A more detailed experimental program was then conducted to determine the effects of several variables on the weld quality. The following variables were examined: Amount of upset, surface preparation of mating surfaces, temperature, gas flow, heating rate, pressure, and time. Type of atmosphere at the weld is another variable that has an effect on the weld[1]. However, at the time this work was carried out, the effect of atmosphere was not investigated. All this work was performed in the atmosphere produced by the heating flames with a 1 to 1 oxygen-to-acetylene ratio.

At the time, it was decided to carry out these extensive tests using carbon steels for some of the work. However this program involving carbon steels was soon abandoned as it was found that while carbon steels were readily welded within a wide range of conditions, much closer control and more exacting conditions during the weld cycle were required for pressure-welding stainless steel. The program was thereafter carried out using stainless steels.





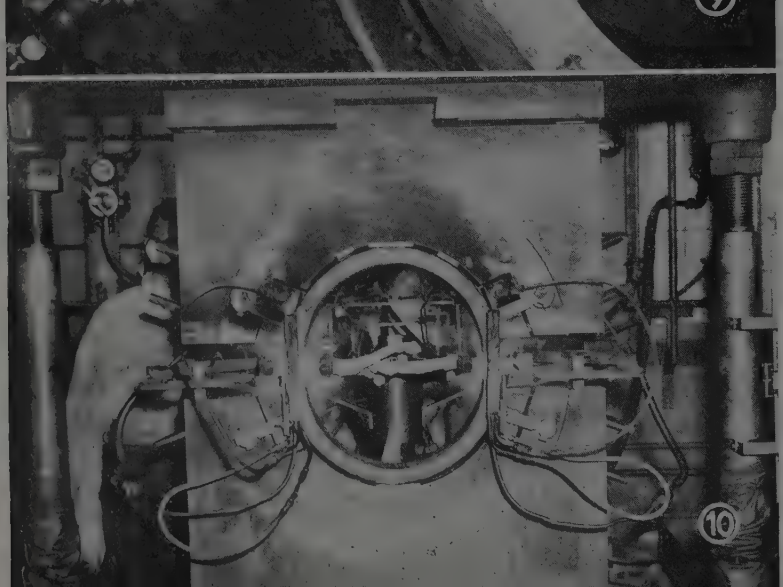


Fig. 8—Pressure welding equipment set up with ring 16¾-in. OD and 13⅝-in. ID

Fig. 9—Heating head arrangements for equipment in Fig. 8

Fig. 10—Larger size pressure welding equipment set up with ring 19¼ in. OD and 16¼ in. ID

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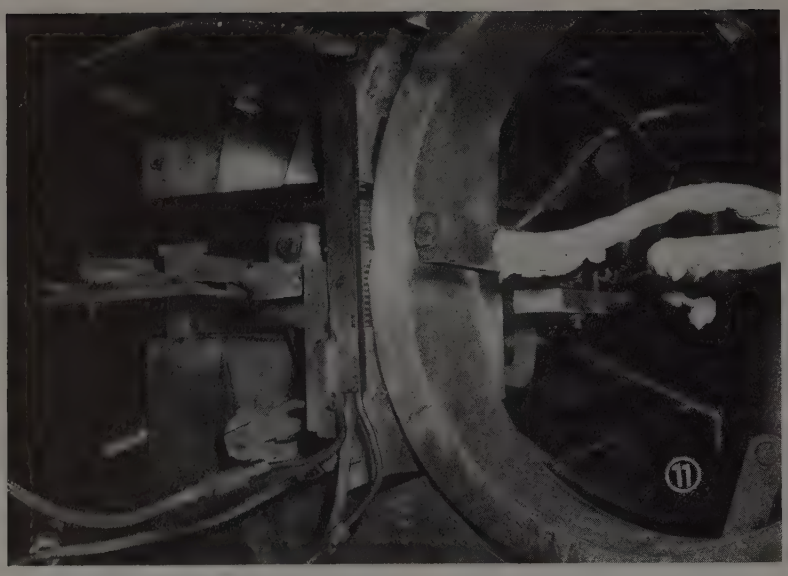

Fig. 11—Closeup of Fig. 10 showing heating head arrangement and use of adjustable contacts

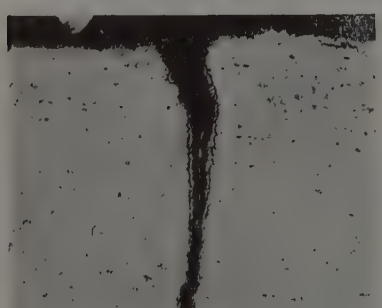

Fig. 12—Crack at surface of poor weld in Type 321 stainless steel before forging

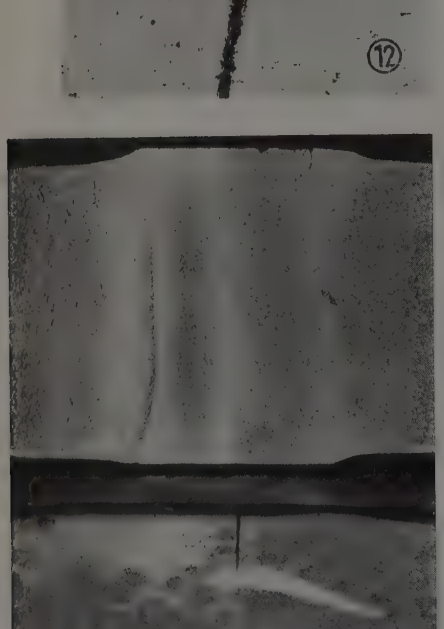

Fig. 13—Examples of poor pressure welds in Type 321 rings: (Top) as welded, with weld upset removed, and (bottom) ring that has undergone expanding test. Improperly bonded areas of weld have split open

Time, temperature, and pressure readings were obtained simultaneously on test pieces, with thermocouple junctions placed on the mating surface at the exact center and immediately below the surface of the cross section. Hydraulic pressure up to 10,000 psi was built up on small hydraulic press at the mating surfaces and the pieces were heated with oxyacetylene torches. As the pieces became plastic, they deformed and thus released the pressure across the weld face. Pressure recordings were made simultaneously with time and temperature measurements. Note data plotted in Fig. 5.

Tests on this section were repeated with two heating rates, one resulting from 50 psi of oxygen and the other from 30 psi of oxygen. From this plot it can be seen that with the faster heating rate resulting with the 50 psi of oxygen, the temperature gradient across the section was steeper. In order that pressure may be used as a measure of temperature, all pieces of a given cross section must be heated under identical conditions. The most reliable method of doing this was to set up pressure-temperature relationships during the actual welding of these rings.

Temperature and amount of upset were found to be the most importa variables in producing a good weld The importance of temperature has bee brought out by other investigators. Welc made at too low a temperature wer not bonded. Welds made at too hig a temperature had either intergranula carbide precipitation or grain boundar oxidation. The effect of welding tem perature on mechanical properties whe other variables are held constant is show in the tensile properties of welds mad at various temperatures shown in Tabl III. The most satisfactory minimu welding temperature for stainless ste was 2200°F for a given upset. Weldin pressures varied from 3000 to 6000 ps although varying pressure within thes limits had little effect when the temper ture was correct.

For welding test pieces, flatness an cleanliness were the most important su face preparations. Satisfactory weld were made with surfaces that had bee machine-ground, or smooth milled. Th amount of upset at the weld was co trolled by the degree of total shorten ing on the test piece and it was foun that total shortenings equivalent to fiv eighths of the thickness, were sufficien provided that the weld faces remaine closed during the welding cycle. A though the larger sections had bee ground sufficiently flat and smooth f intimate contact at the weld face thermal expansion during the heatin cycle had caused the outer edges of th cross section to open up before the meta had attained the plastic state. This re sulted in oxidation, which prevente proper bonding where the faces ha opened.

Tests To Determine Weld Quality: Th joint efficiencies of the welds were teste by every available means. Ability to me the requirements of the forging test w arbitrarily taken as the standard quality required of pressure welds f these applications. Most drastic a most informative was the forging expanding test. Other tests were ma across specimen welds in order that t results of this forging test could interpreted in more familiar terms. The included hot acid etch, tensile, Straus embrittlement plus bend, and microstru ture.

The hot acid etch test was very usef in exposing cracks in welds not comple ly bonded to the outer surfaces, a localized burning resulting at the w from excessive surface temperature. Wh the bond was poor, the etch disclosed fine line at the weld, while if localiz burning had occurred, a characteris pattern became evident.

When specimens containing defe were forged, they failed in a man characteristic of the defect. Overhe

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TABLE I
TYPES AND ANALYSIS OF STEELS USED

Type	C	Mn	Si	Cr	Ni	Ti	Cb
347	0.10	0.04		17.0/	9.0/		
	Max.	Max.		19.0	12.0		8xC
321	0.10	0.04		17.0/	8.0/		
	Max.	Max.		19.0	11.0	4xC	
310	0.20	2.00	1.00	24.00/	19 00/		
	Max.	Max.	Max.	26.00	22.00		
310-Mod.	0.25	2.00	1.75/	24.00/	19.00/		
	Max.	Max.	2.25	26.00	22.00		

TABLE II
CROSS-SECTIONAL DIMENSIONS OF RINGS PRODUCED

Type Stainless	Cross Section
347	9/16 x 2-3/4 in.
347	1-7/8 x 1-7/8 in.
321	3/4 x 6 in.
321	1-7/16 x 2-5/8 in.
310	3/4 x 2-1/2 in.
310	1-1/8 x 2-3/16 in.
310	1-1/8 x 1-7/8 in.

ing caused an irregular and intergranular type of failure, while a poor bond caused a flat or straight type of failure. Tensile tests afforded three criteria for determining weld quality: (1) Ultimate strength; (2) elongation and reduction of area; and (3) type and location of fracture.

Welds with satisfactory yield and tensile strengths only were readily produced, but more exacting conditions were required in making pressure welds which also possessed optimum ductility. Type and location of fracture on a tensile test was correlated with the strength and ductility. Tensiles that parted exactly at the weld with a flat, dull matt fracture invariably were associated with low ductility, and in some instances low tensile strength.

Normal tensile fracture for these stainless steels is a cup-cone type, and welds showing this type of fracture always possessed superior properties of both strength and ductility regardless of whether tensile failure was at or near the weld. The corresponding tensile properties are listed in Table III. The Strauss-embrittlement-and-bend tests gave a good indication of weld quality since only good pressure welds were to withstand the tests.

Only welds appearing sound with a hot acid etch, with satisfactory strength, ductility, and able to fulfill the requirements of the Strauss test, forged satisfactorily. Welds that forged satisfactorily showed complete grain coalescence across the weld, and the interface was well broken up, in some cases entirely eliminated. Welds that failed during forging had not coalesced across the weld and the interface was present throughout. This work confirmed the fact that besides acting as a shaping and sizing operation, forging would also serve as a good proof test of pressure-welded rings.

It was observed that the tensile properties of forged test welds were always better than those of welds that had not been forged. Hot working produced recrystallization, and resulted in a finer grain size. The forging action had also straightened the grain flow fibers at the weld upset, and helped break up the oxide particles at the weld interface.

The superior properties of forged welds may be partly explained on the basis that the severe deformation occurring during forging acted as a selective process that eliminated all but the superior welds. Welds that were tested without subsequent forging may have been slightly less perfect, on the average, than forged welds in spite of the fact that all of the other tests such as acid etching indicated equivalent soundness prior to forging.

Although the physical properties of forged welds were superior, the properties across properly welded pieces, not forged, were adequate for the use for which they were intended. Since a number of rings required a rectangular cross section, these rings were made by pressure welding with no subsequent forging. A proof test devised for these welds consisted of expanding, at forging temperature, rings that had been welded ¼-in. undersize on the diameter.

Details of Manufacture of Ring: The method finally arrived at in producing these rings consisted of joining two semicircular halves by two diametrically opposite pressure welds. This two-piece method was more successful than the one-piece method. It afforded relative ease in the preparation of pieces to be welded in that the weld faces were readily surface ground and cleaned.

Although test pieces were readily welded, numerous difficulties arose in the pressure welding of actual rings. The principal difficulty was the maintenance of intimate contact between the abutting surfaces during the first stage of heating. The metal expanded differentially, because of temperature gradient, so that certain areas of the abutting surfaces separated. This was aggravated by the fact that at no time was the applied load normal to the surfaces. The slight side thrust created was enough to cause considerable trouble. An example of this is shown in Fig. 4. Here a heavy oxide film is present at the interface and has prevented coalescence of grains across the joint. However, a film at the weld interface did not necessarily indicate the presence of oxides, as both oxides and carbides were found in this film.

In order to eliminate the effect of bending, or side thrust, a number of weld surfaces were prepared by a method designated as a "compensating grind," as depicted in the diagram of Fig. 6. This was done by elastically expanding the ring halves to oversize diameters at the weld faces and then grinding. When the proper initial end pressure was applied to these rings, the bending moment caused the weld faces to attain intimate contact. Unequal thermal expansion of the cross section during heating was particularly troublesome on the rings of larger cross section. This expansion caused the faces to open up at the surfaces of sections being welded. This was minimized by adjusting the heating cycle, heating rate, and the heat input to produce thermal expansion in a direction to counteract the thermal expansion.

It is almost axiomatic that the higher the end pressure, the lower the temperature at which the metal will undergo plastic deformation. Use of this relationship was made in the welding cycle in that initial end pressure used was high enough to yield plastic deformation at temperatures between 1300 and 1400° F, in order to close any minute opening that may have occurred during heating to this temperature. In order to maintain intimate contact between the abutting surfaces, a fraction of the upset equivalent to about one-quarter of the total shortening was taken up at this stage. Since a closed hydraulic system was used, the pressure slowly dropped off as the piece yielded under the influence of increasing temperature. When the pressure had decreased to a sufficiently low value which previous experience had shown was an indication that the proper welding temperature conditions had been reached, the final upsetting pressure was applied.

Heating cycles determined for the various section sizes of test specimens were not directly applicable to the heating of rings in these same section sizes. The cooling effect of the greater mass of steel in the rings and of the welding dies and equipment had changed the required rate of heat input at the weld area. Heating cycles were, therefore, determined for each particular job as it was set up in production, and trial rings were put through the entire process in order that the best cycles be established throughout a production run.

The gas flow was adjusted to produce a cycle fast enough to rapidly attain plastic deformation and seal the weld faces, but slow enough to minimize the

temperature gradient and to provide reasonable assurance against burning at the surface. It was not necessary to know the exact gas flow, provided a constant flow was maintained in order to effect reproduceability from weld to weld. However, lack of adequately sensitive measuring equipment made it difficult to duplicate conditions from one run to another exactly, and close supervisory control was necessary.

Requirements of Heating Equipment: An adequate supply of gases was available from the shop pipe lines. Oxygen supply to the lines was from a large storage unit, and generators provided the acetylene.

The main design consideration of heating heads was that of proper heat input across the section to be welded. In some cases heat input was purposely made uneven in order to counteract the effect of unequal thermal expansion. Heating heads were designed to prevent burning, particularly at the corners of the section, and were mounted to permit easy removal of the rings after welding.

Press Equipment: Hydraulic pressure systems were installed on the presses so that variable pressures could be readily attained. Presses were made with sufficient rigidity to maintain correct match of half rings, and with positive stops to insure dimensional accuracy of the welded rings. Dies were required to hold alignment, to support the work, and to transfer pressure to the weld. These had to be heat resistant and, in the case of larger rings, water-cooled to prevent die growth. The portions of these dies adjacent to the work were heated to a dull red when not water-cooled.

Three-point contacts were required for some of the larger rings, as the hot rolled surfaces of the bent half rings did not afford proper bearing against the smooth machined surfaces of the die inserts. Adjustable contacts afforded the adjustment necessary to close-mating surfaces and produced intimate contact within the range of tolerances for bent ring halves. Heating torches were oscillated across the weld to prevent localized burning. In general, the amount of oscillation was equivalent to the total shortening. Both mechanical and manual means were used to obtain this oscillation. A diagram illustrating equipment for pressure-welding rings is shown in Fig. 7, while the smaller of the two machines used is shown in Fig. 8, with a close-up of the heating head arrangement shown in Fig. 9. Fig. 10 shows the larger machine used, and Fig. 11 is a close-up of the heating head arrangement for this machine.

Defects Observed on Welded Rings: Several difficulties were encountered in the early stages of welding of rings. Fissures at the surface of the weld, such as shown in Fig. 12, resulted when the weld faces had opened during the welding cycle. These defects rarely occurred at the inner diameter, but when they did occur they were attributed to too low an initial end pressure. At the outer diameter they resulted from opening caused by excessive bending moment and were prevented by use of the compensating grind. On the larger cross sections these were due to excessive die growth and were eliminated by the addition of adjustable contacts to the die inserts.

The oxide film previously mentioned resulted when weld faces were not in intimate contact throughout the welding process.

Burning resulted from too rapid a heating rate in that the surface burned before the center had attained proper welding temperature. Metal that had been burned broke open during upsetting or subsequent forging operations. It was found that type 310 stainless steels were most susceptible to burning and that this condition could be corrected by proper regulation of heating rate.

Low ductility on a tensile test, mentioned previously, resulted from a moderate amount of oxides at the interface or too low a welding temperature, and was corrected according to the cause.

Quality Control: The following test procedures were used for quality control and proved entirely satisfactory. The weld upset was removed from the rings by milling; the welds were then etched in 50 per cent HCl and examined for fissures, traces of oxide film, and burning. If any of these defects were found, the rings were scrapped; otherwise they were forged. A defective weld would result in a rupture. A number of these jobs were made by pressure-welding with no subsequent forging because the dimensions of the finished pieces required a rectangular cross section. As previously mentioned, proof test devised for these consisted of expanding the undersize rings to proper diameter at low forging temperatures, as in Fig. 13. Extensive investigation indicated that only satisfactory pressure welds were able to meet the test. When welds were made at too low a temperature, or an oxide film had formed at the interface, these split exactly at the weld with a flat type of fracture. Metal that had been burned during the welding process broke with a granular fracture during the expanding operation. See Fig. 13.

Table IV summarizes the quantities produced and the yields for the various ring cross-sections.

TABLE III
TENSILE PROPERTIES OF WELDS

Type 347	Ultimate Strength	Yield Strength	Elong.	Contr.	Fracture
Welded at 2100°F.	77,000	46,500	28.0	29.1	Flat at Weld
Welded at 2200°F.	77,000	44,000	39.0	61.0	Cup Cone
Welded at 2200°F. and Forged	88,000	51,000	55.0	68.5	Cup Cone
Unwelded Control Specimen	88,500	48,500	57.0	59.2	Cup Cone
Type 321					
Through Weld	78,000	45,000	40.5	44.8	
Original Bar	83,000	46,000	61.5	75.1	
Type 310					
Through Weld	75,000	40,000	46.0	51.9	
Original Bar	75,000	42,000	51.0	50.2	

TABLE IV
PERCENTAGES OF GOOD WELDS ON VARIOUS PARTS

Type Stainless	Cross Section	Total Welded	Yield %
347	9/16 x 2-3/4 in.	923	97
347	1-7/8 x 1-7/8 in.	21	100
321	3/4 x 6 in.	24	54
321	1-7/16 x 2-5/8 in.	366	60
310	3/4 x 2-1/2 in.	313	93
310	1-1/8 x 2-3/16 in.	307	32
310	1-1/8 x 1-7/8 in.	189	90

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The foregoing is from a discussion of the subject at the Annual Meeting, American Welding Society at Atlantic City, N. J.

Nickel, Steel Properties Combined in Clad Strip

Development of a rolled strip that combines corrosion resistance and other properties of nickel or Monel with that of steel is announced by Superior Steel Corp., Carnegie, Pa. Featuring an inseparable bond between the steel base and cladding, the composite strip is reported to reduce cost 30 to 35 per cent.

Strip is being produced in widths between ¼ and 10 ¼-in., and in coils ranging up to several hundred feet, depending upon the gage. It is cold rolled in thicknesses between 0.010 and 0.125-in., hot rolled in thicknesses between 0.095 and 0.25-in.

Standard cladding is 10 per cent of the total thickness on one or both sides of the strip. Because it is impossible to separate the cladding from the steel base by any means other than chemical dissolving, the strip can be stamped, drawn, spun, bent or spot welded. Danger of warping or twisting is negligible since thermal coefficient of expansion of the three metals involved is the same.

Engineering News *at a Glance*

SCALP PREVENTION: The foundryman who always assumes that his crucibles are damp when they reach him never has scalped pots, according to the advice included in the latest "Crucible Melters' Handbook," issued by the Crucible Manufacturers Association of New York. Sometimes, shipments of crucibles in transit pass through heavy rains or snows. As a result they absorb moisture which must be driven out by the user. It must be expelled slowly and completely before the crucible is used. If a crucible containing a considerable quantity of moisture is quickly subjected to a high temperature, the moisture will rapidly turn to steam, pressure of which may scalp or spall the crucible. No matter how small the remaining amount of moisture is in a crucible, its heat life is shortened when it is placed in the furnace.

AIDS POLIO VICTIMS: Latest application of General Electric's Thy-mo-trol drive, it was learned in Pittsburgh, is in controlling a new type oscillating bed now being used to combat crippling effects of polio. The new bed, built by Respir-Aid Inc., Toledo, O., is mounted on a motor-driven frame which the drive, a versatile electronic system of controlling motors, see-saws in rhythm with the patient's normal breathing. A small alternating-current motor regulates the arc of travel of the bed's motion. Principal function of the bed is to aid the patient in breathing. Unlike the iron lung, neither the bed nor the motion restricts care of the patient.

REDUCES ORGANIC CHEMICALS: Discovery of a compound that promises to become a universal reducing agent for organic chemicals is reported by Professor H. I. Schlesinger of the University of Chicago, in a paper prepared for the University of Illinois section of the American Chemical Society. Easily prepared from lithium hydride and aluminum chloride, the compound is a white crystalline solid, readily soluble in ether, the solvent in which most of its reduction reactions are carried out. It is said to reduce highly stable organic compounds at room temperatures and normal pressures. It also was applied successfully to the reduction of aryl nitro compounds to the corresponding azo compounds, nitriles to primary amines, and ketones, esters, aldehydes, anhydrides, and acid chlorides to their respective alcohols. One peculiarity is the compound does not attack carbon-to-carbon double bonds, therefore it can be employed to reduce unsaturated organic chemicals. The product also promises to be of great use in tracer chemistry, because under ordinary conditions it reduces carbon dioxide to what appears to be derivatives of formaldehyde.

RESEARCH YARDSTICK: A yardstick by which management can evaluate results of industrial research is described by Fred Olsen, director of research, Western Cartridge Co., in the forthcoming industrial research monograph "Management of Industrial Research," to be published by Van Nostrand Co., New York. The formula enables management to evaluate research costs in the following categories: Where research lowered cost of production or distribution; where it contributed to an improvement in quality in an established product, and where it developed a new product. With the method, it is possible to chart an "index of return" in which actual expenditures for research may be compared quarterly with both estimated and audited returns produced by products that owe their being to research.

WINS TOP AWARD: A 20-year-old mother, who in 3 years made 17 suggestions for improving production, recently received $2494 from Westinghouse Electric Corp., Pittsburgh, for a double-barreled idea that saved money and critical materials. The check presented to Mrs. Phyillis B. Miller was the top award made by the company to a woman employee in the 36-year history of its suggestion system, and was the third largest suggestion payment ever made by Westinghouse. Mrs. Miller discovered that palm-size radar tubes that failed to pass rigid inspection because a trace of air remained inside could be preserved by removing the steel exhaust pipe with pliers, soldering in a new pipe and re-exhausting the tubes to attain a better vacuum. The tube in effect is an electronic switch that keeps outgoing and incoming radar signals from colliding head-on.

EXPANDS FACILITIES: Shop production is to be increased by one third upon completion of the planned construction of a new 80,000 sq ft factory building adjacent to the Aurora, Ill., works of Independent Pneumatic Tool Co., according to Neil C. Hurley, president. Part of a million-dollar expansion program, the new structure is to house machinery and equipment to meet augmented production schedules based on the development of new markets in the automotive, farm and construction fields. Both electric and pneumatic tools are to be manufactured in the new building with space now being allocated for full scale production of the company's new auto valve refacer and hard seat grinder, new line of power saws and other postwar developments.

TO RECORD METALLURGICAL DATA: Advances in ferrous metallurgy made during the war are to be recorded in a series of books by the Alloys of Iron Research, a project of the Engineering Foundation, it was learned recently. According to Dr. A. B. Kinzel, board chairman of the New York foundation, the first volume, now in preparation, is to contain a description of the characteristics and properties of the many alloy steels developed, and a summary of new principles of plastic deformation at elevated temperatures which proved of value in developing new steels for high and low temperature use, as in jet-propelled aircraft. Succeeding books are to include broad discussions of available published and unpublished information on individual series of new steels, and on older steels that were greatly improved in properties in the last few years. Alloys of Iron Research is a major research project of the foundation which was reestablished a few months ago, after a period of inactivity during the war.

"RETREADING" BY WELDING: Use of automatic arc welding for "retreading" railroad "tires" by Estrada de Ferro Sorocabana's railroad shops in São Paulo, Brazil, may well be compared to the economical practice of retreading auto tires, according to General Electric Co. A new locomotive "tire" gives about 150,000 km of service before the flange is worn down to an unsafe limit. A new car flange provides approximately 300,000 km. Such tires are built-up in the Brazilian shops eight to ten times before they are considered unfit for further service. Each restoration adds 40,000 km to the life of a locomotive flange and 70,000 to 80,000 km to the life of a car wheel. Tire material is tempered 0.50 per cent carbon steel. Although this procedure was proved practical by the South American concern, it must be remembered the U. S. Interstate Commerce Commission prohibits any welding of locomotive or car wheel treads or flanges on interstate carriers.

FOR INCREASED TOOL LIFE—
LOW COST—ACCURATE PARTS USE
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JONES & LAUGHLIN STEEL CORPORATION

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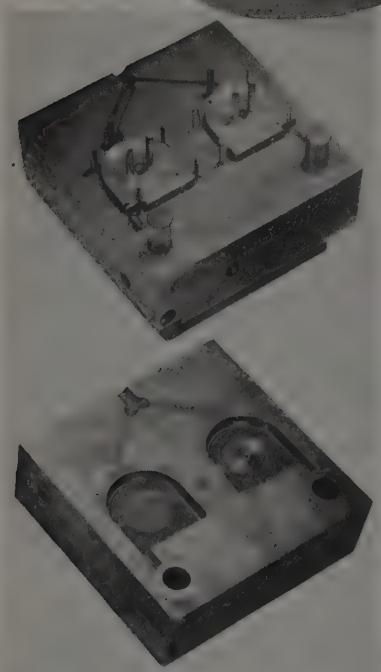
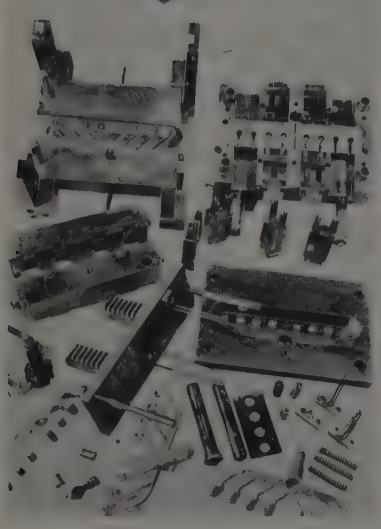
J&L STEEL

By HERBERT CHASE

In spite of wide differences of opinion on specifications for die steels, many different compositions and heat treatments yield satisfactory results

SELECTING *Steels for Casting Dies*





MAKERS of die castings are always faced with the problem of securing suitable steels for casting dies. There is a considerable range of compositions and heat treatments from which to choose, but it is not easy to make the optimum choice, partly because of the many influencing factors. These include: Temperature at which the molten alloy is to be cast; total number of casting that are to be produced; dimensional stability of the steel; heat treatment considered necessary; resistance of the steel to the solvent and erosive action of the molten alloy to be cast; resistance to thermal fatigue; ability to resist mechanical shock and high localized pressures; over-all cost; size and complexity of die; machinability of the die steel; ability to resist wear of sliding parts; tendency of surfaces to oxidize, pit or collect oxides of the metal cast; type of die lubricant, if any, to be used; dimensional tolerances on castings to be made and several other factors of greater or less importance.

With so many variables to be considered, it is not surprising that die casters do not agree among themselves as to the best steels and that the makers of die steels have different ideas as to which compositions and heat treaments are preferable. Much depends upon experiences encountered and these differ as widely as the resulting conclusions. There is some agreement, however, as to the requirements for an ideal die stee and these include the following:

(1) Ability to resist the therm fatigue (especially in casting alloy of high melting point) that ulti mately results in checking and con sequently in rough castings.

(2) Ability to resist the solvent an erosive action of the molten allo to be cast.

(3) Ability to be heat-treated readil and to retain adequate hardnes in service.

(4) Dimensional stability, includin freedom from warpage or crackin in heat-treatment.

(5) Reasonable machineability in th annealed or partly hardened con ditions.

(6) Ability to resist impact and crush ing, especially at partings, eithe when cold or hot, and to resist th pounding of flash into surfaces.

(7) Ability to resist mechanical wea of parts having relative motion.

(8) Ability to resist cleavage crack ing as a result of sudden tempera ture changes.

(9) Freedom from flaws that may b uncovered in machining or that re sult in failure in service.

(10) Ability to resist corrosion and pit ting and chemical attack by suc die lubricants as may be needed

(11) Minimum tendency to "solder" (t

Fig. 1 (top)—Over one million pairs of castings in zinc alloy have been produced in this die but it is still in good condition. The parts produced, center left, are the halves of a housing for a steel measuring tape. Engraving in the die produces raised letters on the castings

Fig. 2 (bottom)—Parts of a complex die for producing gates of eight padlock cylinders, foreground. As there are several cores for each cavity and dimensions must be held within close limits, such a die requires excellent workmanship, and parts are hardened to minimize wear

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Sink bowl deep drawn 8½" in one operation from Eastern Stainless No. 4 Polish "LIQUID ENVELOPE" coated sheet. Upon pooling, uniform satin-smooth silvery sheen requires no finishing or polishing

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SENSATION OF THE METAL SHOW

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BETTER FINISHES AND COATINGS, INC.

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COMPOSITIONS AND TREATMENTS OF SOME DIE STEELS

	C	Mn	Si	Mo	Cr	V	Ni	Co	W	Al	
Latrobe V.D.C.	0.35/0.45	0.40 max.	0.85/1.10	.....	5.0/5.75	0.90/1.10	.....	.....	.....	....	
Doehler	0.37/0.42	.....	.....	1.00/1.25	4.75/5.25	0.40/0.60	.....	.....	.....	....	For very long runs on zinc or for aluminum. Heat to 1800-1825, 9 hr quench in air drawn 1050 6 hr per in. of thickness.
ZT	0.50	0.80	0.40	.....	0.85	.....	.....	.....	.....	....	
Pressure die No. 8....	0.35	0.55/0.65	0.85/1.00	0.45/0.60	4.9/5.25	0.10/0.15	.....	.....	.....	....	
NE 8645	0.45	0.75/1.00	0.20/0.35	.....	0.40/0.60	.....	0.40/0.70	.....	.....	....	
2	0.45	0.70	.....	.....	0.80	.....	1.25	.....	.....	....	Used for Zn, Sn and Pb. Sometimes heat treated for Zn.
3	0.30	0.50	.....	0.50max.	1.20	.....	.....	.....	.....	1.20	Used for Zn and Pb, preferably nitrated.
4	0.45	0.60	.....		2.25	0.20 opt.	.....	.....	.....	....	For long run Zn, heat treated.
5	0.35	.....	0.90	0.50 opt.	5.25	0.25 opt.	0.50 opt.	0.50 opt.	4.5	....	Used heat treated for Al & Mg but 5 is giving way to 6 & 7.
6	0.30	0.60	0.90	1.0	5.00	0.25 opt.	.....	.....	.....	....	
7	0.30	.....	0.90	1.0	5.00	0.25 opt.	.....	0.50 opt.	1.00	....	Used heat treated for Al & Mg.
8	0.35	.....	.....	.....	3.00	0.50	.....	.....	10.00	....	
Lusterite Drill Rod (for cores) ...	0.80–0.90	0.50	0.50	.....	16.5–18.0	.....	.....	.....	.....	....	Used for Cu base alloys, heat treated.

alloy being cast) and to gall or scratch.

(12) Ability to resist fatigue under mechanical stresses.

These requirements are not arranged in order of importance, partly because the order varies with the type of metal being cast and with other factors, including the experience and opinions of those concerned. Some steels that are entirely satisfactory for use (even without heat treatment in some cases) in casting the low-melting alloys based respectively on zinc, lead and tin, are not at all satisfactory for higher melting aluminum base and magnesium base casting and are wholly unsuited for the copper base alloys which have the highest casting temperatures of any alloys employed for die casting.

For the copper alloys, refractory steels (of the "semi-high-speed" type) are considered essential for usual commercial runs, as some parts of dies, especially cores, often operate at or about red heat. If smooth castings are required in copper base alloys, dies commonly have to be replaced or cavity blocks or other parts renewed after 5000 to 10,000 fillings as die steels that are not subject to heat checking (thermal fatigue) in casting copper alloys have yet to be developed.

Thermal fatigue causes a network of cracks that extend well below the die surface and are filled with the alloy being cast because of the extremely high pressures to which it is subjected. The result is raised veins on the castings. These veins are not detrimental to the casting, except where surfaces that are smooth and are not to be machined are required. The veins, however, result in unsightly appearance and make castings harder to eject from dies and harder to polish.

As alloys based on aluminum and on magnesium have a considerably lower melting point than the copper alloys, "high-alloy" dies are not required. Heat checking does occur in time but dies suited for as many as 100,000 cycles without renewal of cavity blocks are reported to be possible unless exacting requirements on surface finish prevail or unless unusually close dimensional limits must be held.

Low-Alloy Steels Preferable

For zinc alloys, which are in widest use, trouble from heat checking of dies is rarely encountered and well made dies have been used for a million or more fillings without heat checking or significant deterioration in die surfaces exposed to the hot metal, though mechanical wear does occur and such parts as cores and ejector pins may require replacement. Even unhardened carbon steel can be used *for short run* dies to cast zinc, but hardened low-alloy steels are preferable.

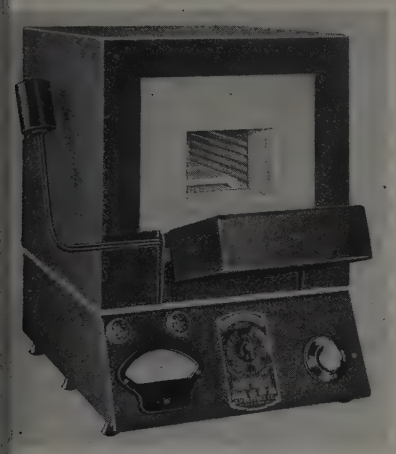
Some die casters of zinc alloys use a die steel that is purchased hardened to about 190 to 300 brinell before machining and requires no subsequent hardening. This practice commonly avoids significant changes in die dimensions after cavities are sunk and polished but, if the machining relieves strains that result in significant dimensional changes, drawing is done after cavities are machined close to finished size and any slight dimensional changes are then corrected in final grinding or polishing.

Dies for aluminum and magnesium are commonly heat treated and are drawn after quenching but these operations are not done until all machine work except final grinding and polishing of die cavities is completed. The same procedure is often followed in making long-run dies for zinc alloys when such dies are not made from prehardened steel. Heat-treatment should be so done that warpage and other dimensional changes are minimized, nevertheless it may sometimes necessitate considerable reworking by grinding, or even making a newly machined cavity block.

Use of a die steel that changes its dimensions a minimum amount as a result of heat treatment or that, at worst, displays an orderly and predictable dimensional change is, therefore, highly desirable. Warpage and dimensional changes can be minimized by slow heating. The time to bring dies to hardening temperature should not be less than 1½ hours per inch of greatest thickness of block plus that of material in which it is packed while being heated. Furnace temperature should not exceed 400° F when dies are put in.

Where, as in many die casting plants, both zinc and aluminum are cast, the same steel and the same general procedure is often used on all dies. This avoids duplicate inventories, simplifies shop procedures and avoids the possiblity that a die steel suited only for zinc will be chosen by mistake for use with aluminum and prove unsatisfactory. This practice also makes it possible to use the die for either zinc or aluminum, in most cases. A die suited for aluminum is also satisfactory for zinc but if designed for zinc it may not be adaptable for alumi-

(*Please turn to Page* 109)



Laboratory Furnace

An automatically controlled furnace for precision use in laboratories, small unit and production work has been developed by K. H. Huppert Co., 6830 Cottage Grove avenue, Chicago 37. Termed the No. 5 DeLuxe, it features combination 3-way heat range switch, and an automatic temperature timer which maintains constant temperatures ranging from 200 to 1800° F, with a minimum variation of not over 10°. Heating elements are of high temperature alloy wire. Furnace, illustrated above, is of all steel construction, and is provided with a heavily insulated, counterbalanced door. Pyrometer, two porcelain loading trays and two pilot lights are included. Dimensions of work chamber are 4¾ x 3¾ x 9 in. Throat opening is 2 in.

Steel 1/13/47; *Item No.* 9061

Boring, Milling Machine

Horizontal planer type boring, drilling and milling machine, immediate right, features electronic drives for all feeds, nonmetallic ways for table and column base and automatic power clamping of table, column, headstock and end support. Developed by G. A. Gray Co., Cincinnati, it is controlled by a few simple controls. These consist of a pendant push button station and several levers. Separate motor provides feed and rapid traverse movements of table. Another motor is used to control table and headstock feed, permitting independent feeds and making it possible to follow an irregular line with the cutter. Table is driven by patented "stud shaft spiral geared drive" which gives smoothness of motion. Headstock provides 24 speeds in geometric progression, 4½ to 900 rpm for 5 and 6 in. bar and 2½ to 500 rpm for 7 and 8 in. bar. Safety devices and interlocks protect machine and work in event of faulty operation.

Steel 1/13/47; *Item No.* 9056

Flexible Coupling

Based on the gear-tooth principle, a new flexible coupling, directly above, is being manufactured by Industrial Machine Works Inc., South Hanover, Mass., for high speed applications. Two identical end-pieces with involute gear teeth mate with a center-piece containing rack grooves running transversely on opposite sides, providing for simultaneous automatic correction for angular and parallel misalignment. Centerpiece is made of lubricant impregnated sintered bronze. Torque capacity in standard sizes is up to 1500 in. lb.

Steel 1/13/47; *Item No.* 9060

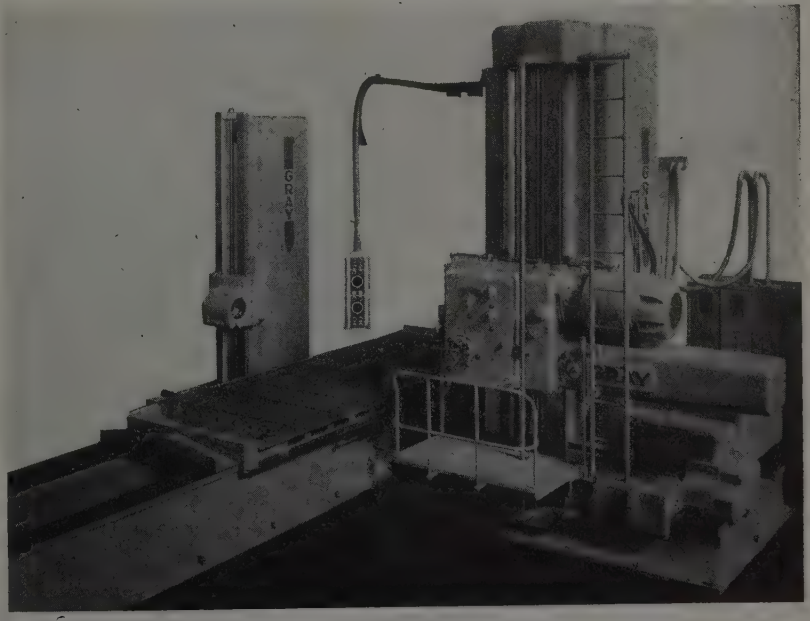
Knee-Type Tool Bits

Kennametal Inc., Latrobe, Pa. has developed a new line of Kennametal-tipped tool bits for use in knee attachments of turret lathes. Bits are available in a range of cemented carbide compositions, for machining steel, cast iron, and nonferrous metals. They are offered in the following sizes: Style 11K30—½-in. square by 3½ in. long; style 11K40—⅝-in. square by 4 in. long; style 11K50—¾-in. square by 4½ in. long.

Steel 1/13/47; *Item No.* 9975

High Frequency Voltmeter

Suitable for general use in the laboratory, on the test bench or production line, the new voltmeter, directly above, manufactured by Alfred W. Barber Laboratories, 34-14 Francis Lewis boulevard, Flushing, N. Y., offers better than 5 per cent of full scale accuracy on all ranges.



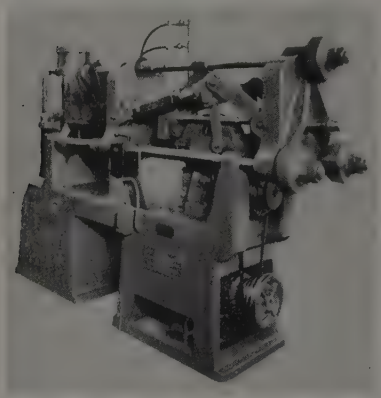
(All claims are those of respective manufacturers; for additional information fill in and return the coupon on page 106)

Designated as model 32, the electronic device, when equipped with a radio frequency probe, has a low input capacity of ¾ mf, extending the range of measurement from 50 to 500 megacycles. It measures 0.3 to 300 v radio frequency in five ranges: 3, 10, 30, 100 and 300 v. Input of impedance is ¾ mf at a Q of about 200. Power supply required is 115 v, 60 cycles, 30 w.

Steel 1/13/47; *Item No.* 9057

Die Casting Machine

Fully automatic, high speed die casting machine, announced by Light Metal Machinery Inc., 736 Penton Building, Cleveland 13, eliminates between cycle delays by a patented cycling mechanism



that provides for automatic die movement, shot and ejection in continuously repetitive cycles. Once cycling rate is selected and set, operator proficiency has no effect on production rate. He merely fills the melting pot and lubricates the die.

Machine may be operated at any one of four fixed speeds: 240, 330, 520 and 720 shots per hour. Shot capacity is 16 oz with a casting area of 30 sq in. Die changes average 15 min including complete change and setup.

Steel 1/13/47; *Item No.* 9928

Vapor Degreaser

A vapor degreaser embodying a controlled cool-air principle has been developed by Mabor Co., Clark Township, Rahway, N. J. It is self-distilling and completely self-contained. Built-in storage tanks are provided as part of the unit.

By increasing the flow of cooling air, vapor level oscillation of the degreaser is substantially reduced. As a result, consumption of solvent is also reduced proportionately. An extra heater, foot pedal operated, helps to increase vapor formation, and overcome the shock load as work is placed in the machine. Equipped with casters, the equipment may be used as a portable unit.

Steel 1/13/47; *Item No.* 9976

Coil Testers

Two coil testers designed to detect short circuits and defective insulation in high-speed production testing of electric coils are announced by General Electric Co., Schenectady, N. Y.

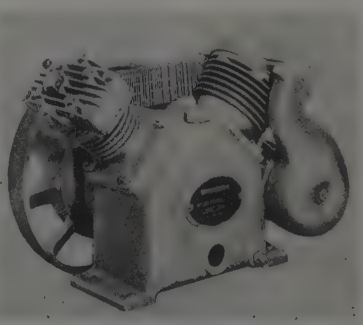
Low-voltage tester shows presence of short-circuited turns in a coil. The turn-to-turn voltage is insufficient to break down partially faulty insulation. High-voltage

tester is used when an overvoltage test is required for the insulation between turns and layers of coils. The turn-to-turn voltage in the high-voltage tester is high enough to stress the insulation beyond service requirements.

Steel 1/13/47; *Item No.* 9668

Air Compressor

Air compressors designed around established motor horsepower, are being manufactured by Worthington Pump & Machinery Corp. of Harrison, N. J. The



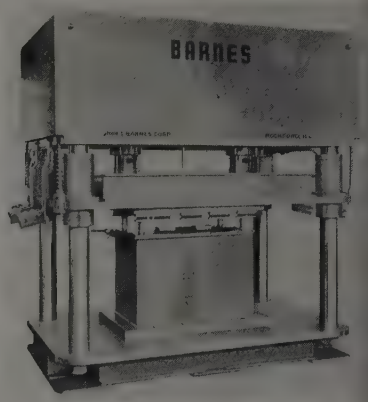
line, designated as Air King, includes single-stage and two-stage sizes for pressures up to 250 psi for mating to standard motors of 1 to 15 hp. Arrangements include self-contained power driven models mounted on bases or tanks as well as bare compressors for either direct or V-belt connection to drivers.

Line also introduces a new principle in automatic starting of compressors. A centrifugal clutch in each compressor permits the driving motor to attain full speed before the compressor turns, thus eliminating the need for starting unloaders, check valves, release and bleeder valves, etc. Direct power drive eliminates transmission losses and drive adjustments.

Steel 1/13/47; *Item No.* 9947

Hydraulic Presses

Sheet metal is handled at high speeds on the two new hydraulic presses of 25 and 50 ton capacities recently announced by John S. Barnes Corp. of Rockford, Ill.



Designed for piercing, punching, forming, and drawing of sheet metal parts, they feature combined functions of several presses into one compact machine. Down time of the machines is cut sharply because of flexibility of adjustment.

Each press is powered by a self-contained hydraulic unit which insures smooth press operation, constantly under finger-tip control. Dual electrical controls increase safety and flexibility of operation.

Steel 1/13/47; *Item No.* 9977

Carbon Dioxide Nozzle

For added fire protection, screening nozzles, designed to cut off or screen a fire's oxygen supply, are available for use with standard carbon dioxide fire extinguishing systems manufactured by Walter Kidde & Co. Inc, Belleville, N. J. Nozzles especially adaptable to open-end cleaning booths, dip tanks, and fan-openings where spaces need screening when fire breaks out, since in-drafts often suck air to the blaze, feeding the flames.

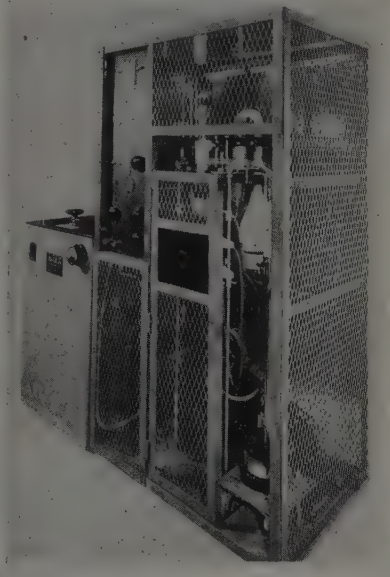
The nozzles, throw a curtain of carbon dioxide across the openings and usu-

(All claims are those of respective manufacturers; for additional information fill in and return the coupon on page 106)

ally operate in conjunction with a built-in extinguishing system, using the same high pressure gas supply and piping. Screen is a double one, with one blast of snow-white gas shooting straight across the opening and second series of jets aims at an inward angle, diluting the air that gets past the first screen.
Steel 1/13/47; *Item No.* 9900

Oxygen Determinator

Fewer than 10 men are required for an analysis of the oxygen content of open-heart melts with the Cenco-Derge oxygen determination apparatus, illustrated here, developed by Central Scientific Co., 1700 Irving Park road, Chicago 13. In the procedure, a sample is poured in

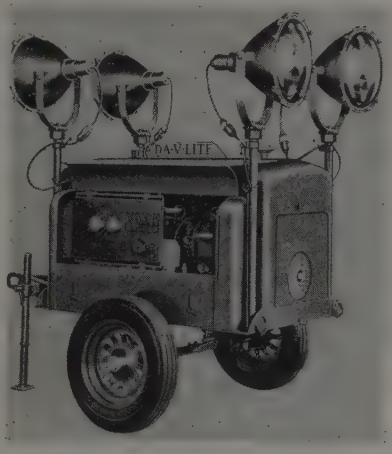


a specially designed mold and a piece of this sample is weighed and introduced, through a mercury vacuum lock, into an induction furnace operating under vacuum. At a temperature of 2800 to 3000° F the sample melts in 20 sec and all oxides are reduced by carbon present in graphite crucible. Resulting carbon monoxide is accurately measured and per cent of oxygen is computed from a simple equation. Completely enclosed in a steel frame, apparatus is protected electrically and mechanically.
Steel 1/13/47; *Item No.* 9059

Lighting Units

Production of four new Da-V-Lite portable lighting and power units is announced by Davey Compressor Co., Kent, O. Designed to provide light and power, each unit is built around a 5000 w Westinghouse self-excited, self-regulated alternating current generator which is driven by a 15 hp 4 cylinder Wisconsin air-cooled engine, equipped with electric starter.

Floodlight models such as the one illustrated are equipped with four 16 in. floodlights, providing 185,000 candlepower per light. Searchlight models are



equipped with two 18 in. searchlights furnishing 1,965,000 candlepower per light. Combination models are designed for both work-lighting and spot-lighting, with two floodlights and two searchlights. Beacon models are for special directional lighting applications, having one 24 in. 11,280,000 candlepower searchlight. All are available in skid and 2-wheel spring trailer mountings.
Steel 1/13/47; *Item No.* 9941

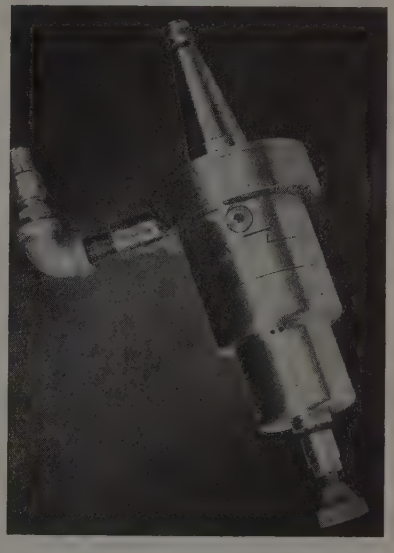
Electric Handtool

An electric handtool and portable grinder with a 1/5-hp motor that operates at speeds to 40,000 rpm is announced by Precise Products Co., Racine, Wis. Tool has a large, rigid precision quill

fitted with a No. 0 Morse taper allowing interchangeable mounting of precision collet chucks for rotary cutters and millers and a Jacobs chuck for small or special arbors for unmounted grinding wheels. Four ball bearings which support quill and motor can be lubricated by a small pressure gun furnished. Cooling is accomplished by fan mounted on motor shaft. Called the Precise-40, the tool can be used as a handtool or mounted in stand, vise, lathe or milling machine.
Steel 1/13/47; *Item No.* 9944

Borer-To-Grinder Adaptor

High speed air-driven attachment, illustrated here, which converts jig borers and other machine tools to precision jig grinders is announced by Vulcan Tool Co., 730 Lorain avenue, Dayton 10, O. Called the Vulcanaire, it is an adaptor that fits the chuck of any machine tool. It



features controllable speeds ranging from 30,000 to 75,000 rpm, with 4 to 8 cu ft of air per minute required for the complete speed range. Unit is 2½-in. minimum diameter and, exclusive of adaptor and grinding wheel, 7½-in. overall. It grinds holes from ⅛ to 1½-in. It also is furnished with dust collector, air filter, pressure gage and oiler. Models for adapting lathes, milling machines and internal and surface grinders are also available.
Steel 1/13/47; *Item No.* 9062

Test Instrument

An electronic test instrument providing an accurate means of measuring a wide range of voltage, current and resistance values found in many types of industrial electronic apparatus is announced by Sylvania Electric Products Inc., 500 Fifth avenue, New York 18.

Designed particularly for accurate measurement of electrical conditions in

(All claims are those of respective manufacturers; for additional information fill in and return the coupon on page 106)

circuit components operating with power up to 300 mc, the instrument employs the tiny proximity fuse type tube.

Features of type 134 Polymeter include preset factory adjustments permitting correct zero setting for all ranges through one front panel adjustment; convenient range switch for correct multiplier values; five jacks for plug-in test-lead readings of alternating and direct current volts; ohms; amperes and milliamperes.

Steel 1/13/47; *Item No.* 9938

Unit Substations

High voltage incoming line, transformer, and low voltage feeder sections are combined in one compact assembly in new All-In-One unit substations built

by Wagner Electric Corp., 6400 Plymouth avenue, St. Louis 14. An air-cooled transformer for indoor installation, noninflammable liquid-filled or oil-filled self-cooled transformers are available for use with unit.

Substations are standardized in ratings 100, 150, 200 and 300 kva, 3-phase, 60 cycles. Choice of combinations of different types of transformers and high and low voltage equipment makes them suitable for a wide range of applications.

Steel 1/13/47; *Item No.* 9939

Multirange Tachometer

Switchboard tachometer type 40 E having five heads and three speed ranges is offered by Metron Instrument Co., 432 Lincoln street, Denver 9. The instrument

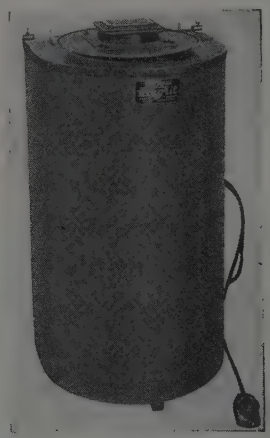
has permanently mounted tachometer heads at five different machines, all wired to the central indicating unit by ordinary BX cable or conduit. A rotary selector switch on indicating unit selects machine on which speed is to be measured. The machines may be remote from the location of the indicating unit.

Tachometer shows three separate speed ranges—these may be any range between 1 rpm full scale and 50,000 rpm full scale. Switch on the panel of unit selects proper speed range. Instruments are available in either box type switchboard units or in the flush switchboard type.

Steel 1/13/47; *Item No.* 9948

Marking Unit

Designated as the Airgrit, a marking machine for marking delicate or precision parts having ground or mirror surfaces, is offered by Jas. H. Matthews & Co., 1315 West Liberty avenue, Pittsburgh



26. Impressions are produced by a short blast of fine grit against rubber or celluloid stencil masks, upon which part is placed.

Unit is operated by air pressure, and is constructed for very fine work. It operates most successfully on a volume of air at low pressure, 10 lb at nozzle.

Device also is equipped with an electric timing unit that enables operator to fix length of blast. Stencil masks, into which the desired marking is cut, are furnished in celluloid or rubber. Best results are obtained by use of characters 1/16 in. in size or larger.

Steel 1/13/47; *Item No.* 9912

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Buffing and Polishing

(*Concluded from Page* 85)

aligning itself—and that portion of the belt which it backs up—with the contour of the surface being polished. Thus abrasive action is distributed evenly over high and low areas.

There are various designs of back stands. One has means for adjusting the stud that carries the pulley so that the belt will "track" correctly. The column carrying the pulley is hinged to the base and counterweighted to give proper belt tension. A foot-operated latch keeps the counterweight from interfering with belt changes.

Another backstand idler with two pulleys on the column instead of one, gives a long abrasive belt a triangular path. This type is especially suitable for use in polishing and buffing departments where floor space is at a premium. One of the backstand pulleys is held in a swinging bracket, springloaded to maintain proper belt tension.

A backstand idler made by a manufacturer of special polishing machines, has a swinging action on a hinge shaft mounted in the column base. Slack in the abrasive belt is taken up automatically by spring tension, adjustable to suit various types of work. The ball bearing idler pulley is held in a yoke that can be swiveled by means of a handwheel so as to track the belt properly. A cam arrangement, built into this idler allows belts to be changed easily. This unit is adjustable for use either at the right or left side of a polishing stand, simply by turning the column and upper assembly halfway around.

Inasmuch as abrasive belts operated on backstand idlers are of lightweight type, and usually run under low tension, it is important that idler pulleys also be lightweight, to minimize starting inertia. In one successful design the pulley, and stud on which it is mounted, are carried on a short, counterweighted arm, the counterweight providing proper belt tension. A hydraulic safety stop keeps this counterweighted arm from putting too great pressure on the belt while starting.

Keen user interest in backstand idlers has inspired leading manufacturers of polishing and buffing stands to create such units for use with their own machines. One of these models carries two pulleys rotatably mounted on a polished tubular standard so they can be swung around for use as either a right-hand or left-hand machine. The clamping brackets holding the pulleys, in addition to being rotatable on this standard, can be adjusted vertically to compensate for differences in belt lengths. Uniform belt tension is maintained by a spring-loaded adjusting screw acting on the lower pulley and readily controlled from the operator's position. This lower pulley has swing-type mounting on its bracket. Belt-tracking adjustment of the top pulley also can be accomplished from working position.

Another model by this same builder carries only one pulley on the column. In this design the entire column is mounted on a hinge-shaft on the baseplate; a spring-loaded adjusting screw with convenient handwheel is provided. Adjustable belt tension and also swinging of the column inward for easy changing of belts, thus is attained.

Except for the small amount of "float" permitted by spring-loaded, the column adjustment is definitely determined by the handwheel. Tracking of the belt can be accomplished either at the backstand idler or from the operator's working position. The combination hood and belt guard is provided with exhaust outlet either to a unit dust collector or to the central exhausting system.

(*To be concluded*)

Selecting Steels

(*Concluded from Page* 100)

um. By using only one steel, the toolroom becomes familiar with its performance and can predict, as a rule, what dimensional changes are likely to occur in heat-treatment and make suitable allowance for these.

Steels for die casting zinc usually fall to one of the following classes: (1) rehardened, free machining; (2) oil hardening; (3) precipitation hardening; (4) soft; (5) hobbed impressions and case hardening; (6) half hard. A metallurgist with a prominent die caster makes the following comments on each of these:

(1) Leaded steels have a decided tendency to pit. High sulphur steels show some pitting but have also shown a tendency toward fatigue failure.

(2) Oil hardening steels show greater warpage characteristics and much more movement (dimensional change) during hardening. Danger of cracking during hardening and of soft spots occurring are present. Flaws are more likely to occur in this type than in high grades of alloy steels.

(3) Precipitation hardening steels generally are too soft but much work is being done with them at the present time.

(4) Parting lines "jam up." If ejectors break, impressions are likely to be jammed. Washing at gates is encountered.

(5) Case "draws" in a short time except in unusual instances where the die temperature can be kept below 300° F.

(6) Half-hard steels are too soft and are very expensive to machine where small grinding operations are required.

The metallurgist of this company indicates that many makers of die steels advocate a composition that includes about 5 per cent chromium and 1 per cent molydenum. This steel is of the hot-work type and is heat-treated after machining. It is considered well suited for long-run zinc dies and for aluminum or magnesium. Silicon content usually ranges around 1 per cent and manganese about 0.5 per cent. Some makers add up to 0.5 per cent vanadium and at least one uses 1.0 per cent vanadium in place of molybdenum.

When dies are used with zinc only, a lower alloy, containing 0.30 per cent to 1.00 per cent chromium meets ordinary requirements even for long-run work, at least in the opinion of some die casters. But the wear on such a die may be somewhat greater than for one having higher alloy content. It probably is wise in most cases to follow the recommendations of the maker of the die steel in respect to heat-treatment but the heat-treatments suggested in the table are believed to be indicative of good practice.

The foregoing comments are intended primarily to refer to the blocks for die cavities or slides forming cavity walls. It is not uncommon to employ softer and cheaper steels for chases or holders into which the cavity blocks are pressed. This is done especially in multiple-cavity and combination dies and in those requiring blocks that must be hobbed or are highly complex. Some die casters use stainless or other special bar stock, for core and ejector pins and such parts as guide or angle pins, that do not attain high temperatures, can be made from hardened high-carbon steel that can be ground.

Data in the accompanying table give approximate compositions and suggested heat treaments for several types of die steel. Some of the data are from a table being prepared for the 1947 edition of the Metals Handbook issued by the American Society for Metals, others from metallurgists associated with established die casters.

By J. A. Pierce
Ceramic Engineer
Bethlehem Steel Co.
Sparrows Point, Md.

Considerations in Size distribution of CLAY FIREBRICK

Fig. 1 — Arrangement of checker brick in open-hearth regenerator

Lack of close control on size of brick intended for straight flue checker chambers for open-hearth regenerative systems handicaps the steelmaker. Brick shipments show greater variation in average size from source to source than exists between individual brick from any single source

REFRACTORY manufacturers in producing any firebrick to the close tolerance expected by consumers, are confronted by a number of normal operating variables which affect the precision of the final dimensions of the product. These variables include:

1. Composition of prepared batch.
2. Water content of prepared batch.
3. Grain sizing.
4. Forming pressure.
5. Firing temperature.

To compensate for these normal variables the American Society for Testing Materials allows the manufacturer a maximum variation of plus or minus 3 per cent dimensions under 4 in. and plus or minus 2 per cent on dimensions 4 in. or over. The accuracy with which a producer approaches the desired final nominal size of a brick is determined by one factor only—die size. It should be the aim of all refractory manufacturers to have exact accuracy on aim size of final product so that the ASTM allowable variation will be necessary only to the extent of taking care of the manufacturer's lack of precision and not his lack of accuracy as well. This is not the case at the present time. Data presented herewith will show that there is more variation between the average size of product received from different manufacturers (caused by lack of accuracy due to faulty aim size or die control) than there is variation in individual pieces from any one manufacturer (caused by lack of precision due to normal variables in plant operation as previously cited).

Such a situation normally causes little concern to the consumer as the ASTM specification is close enough for normal brick-laying requirements. However, lack of close control on final brick size handicaps any industry which uses straight flue checker chambers for regenerative systems.

Practice in a great many steel plants is to lay the checker bricks in the regenerators of open-hearth furnaces in a so-called "basket weave" manner. This method of construction is desirable because the individual bricks in each course are tied-in securely, thereby affording the maximum mechanical stability. Basket weave checkers can be laid with any nominal size brick; the only factors to be considered in choosing a brick size being the size of the opening desired, which governs the ratio of heating surface to flue area, and the overall cost of the installation. The present study deals only with 9 × 4½ × 3-in. brick which give 7½ × 7½-in. flue opening. This size is the most commonly used throughout the steel industry. Fig. 1 shows the checker arrangement.

As can be seen from this illustration bricks used in laying checkers of this type must be nearly the same size or the flues will not be in line. Oversize bricks are the most troublesome. A setting which

is started with normal or undersize bricks and is finished with oversize bricks will tend to "expand" in all directions toward the top of the setting. Settings finished with undersize bricks, even when started with normal length bricks, do not give as much trouble because short spaces can be left between the undersize bricks. Some of the mechanical stability is sacrificed in this instance, when the expansion of the clay refractories in getting up to operating temperature is not sufficient to take up all of the slack.

In extreme cases of misalignment, due to oversize brick, flues may even be partially blocked off. In moderate cases, extreme trouble is soon encountered in operation since any horizontal surfaces presented in the vertical flues become piled high with dirt which normally would go to the horizontal stack flues. This means that more time must be spent cleaning checkers on rebuilds and the ultimate checker life will be materially lessened as flues become permanently clogged in a shorter length of time.

The greatest amount of difficulty is encountered in laying checkers of this type if the bricks are supplied by two or more sources. It is generally found that there is a greater variation in average brick size from source to source than exists between individual bricks from any single source.

Data were obtained on the length dimension of 32 samples from each carload of re-pressed or dry pressed 9 × 4½ × 3-in. open-hearth checker brick received from one plant of each of three different suppliers. Thickness is as important as length but is not considered in this study. The length was determined as the shortest perpendicular distance between two parallel plates butted against opposite ends of the brick and was measured to the nearest 0.01-in. A machine equipped with such parallel plates, one movable and one stationary, was used to make the measurements which were read on a vernier scale attached to the movable plate and a fixed scale attached to the fixed plate. Fig. 2

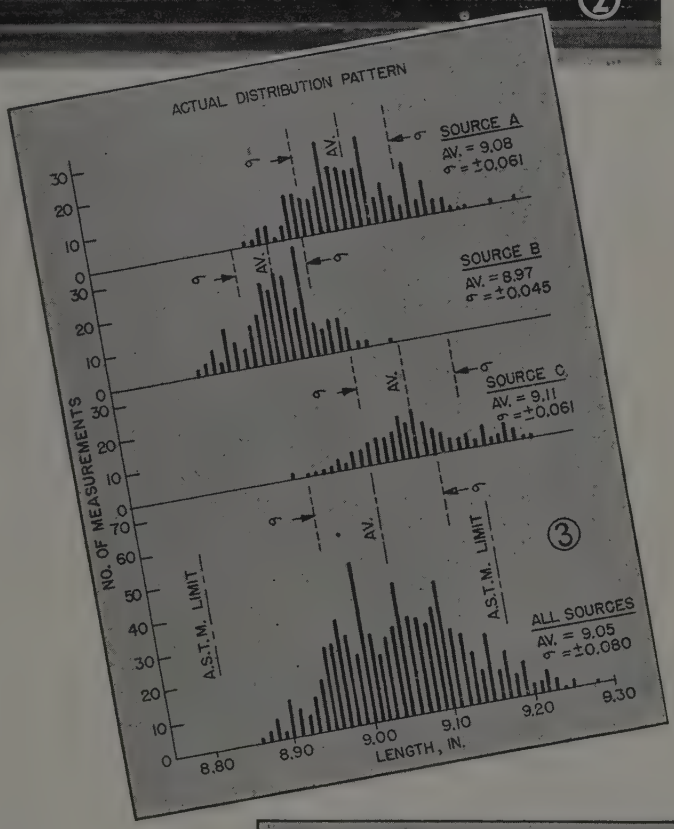
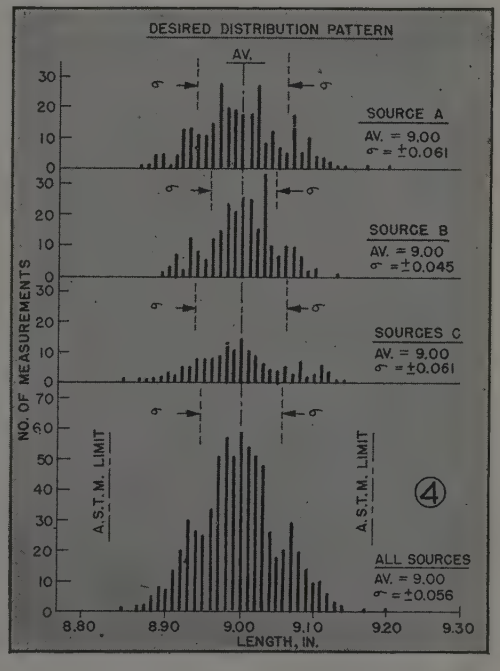


Fig. 2—Device used for determining length of checker brick

Fig. 3—Actual distribution pattern with proper die size control

Fig. 4 — Individual length distribution patterns of three brands of brick



DEVIATION IN LENGTH OF OPEN-HEARTH CHECKER BRICK

Shipment No.	Average length, AV	Average range of values, R*	Variation from avg. including 90% of individual samples, ±, R × 0.729	Std. deviation of individual samples, ±, σ **
1	9.14	0.12	0.087	0.055
SOURCE A				
2	9.06	0.10	0.073	0.047
3	9.08	0.08	0.058	0.045
4	9.08	0.13	0.095	0.060
5	9.12	0.09	0.065	0.048
6	9.08	0.13	0.095	0.058
7	9.04	0.11	0.080	0.050
8	9.06	0.07	0.051	0.038
9	9.04	0.07	0.051	0.040
Average for nine shipments as groups:	9.08	0.10	0.073	0.049
σ for all 288 individual samples from 9 shipments taken as a single group—Source A				0.061
SOURCE B				
1	8.98	0.06	0.044	0.032
2	8.99	0.08	0.044	0.028
3	8.99	0.08	0.058	0.039
4	8.97	0.09	0.065	0.041
5	8.96	0.09	0.065	0.044
6	8.95	0.07	0.051	0.033
7	8.94	0.13	0.095	0.058
8	8.98	0.09	0.065	0.050
Average for eight shipments as groups:	8.97	0.08	0.061	0.041
σ for all 256 individual samples from 8 shipments taken as a single group—Source B				0.045
SOURCE C				
1	9.08	0.13	0.095	0.060
2	9.10	0.06	0.044	0.031
3	9.12	0.13	0.095	0.054
4	9.11	0.14	0.102	0.075
5	9.14	0.10	0.073	0.059
Average for five shipments as groups:	9.11	0.11	0.082	0.056
σ for all 160 individual samples from 5 shipments taken as a single group—Source C				0.061
Average for twenty-two shipments as groups—all three sources	9.05	0.10	0.072	0.048
σ for all 704 individual samples from 22 shipments from all three sources taken as a single group				0.080

*The 32 samples were divided into eight groups of four. R is the average of the ranges of the eight groups.

**σ, the standard deviation, is the square root of the average of the squares of the deviations of the samples from their average value and is cited as the most useful measure of dispersion in the A.S.T.M. Manual on Presentation of Data. Statistically the limits include at least two-thirds of all the individual samples.

shows the measuring device used.

Data collected and calculated factors necessary for their interpretation are presented in the accompanying table. The data indicate the following:

1. With but one exception (Shipment No. 1, Source A), the average length of brick from each shipment varied a maximum of plus or minus 0.04-in. or 0.45 per cent from the average of all shipments from that particular source, indicating excellent precision or ability to reproduce a given size.

2. The average standard deviation for individual brick samples in any particular shipment from any one source was plus or minus 0.048-in.; the maximum σ for any one producer on all shipments from his plant being plus or minus 0.061 (Source A and C).

3. The variation of average lengths of bricks from each shipment from the average length of all shipments from all three sources was as much as +0.09 and −0.11-in. (+1.0 and 1.2 per cent), indicating bad accuracy or aim size control from source to source.

4. The standard deviation σ for all 704 samples from all three sources taken as a single group was plus or minus 0.080-in.

Each individual manufacturer was able to duplicate his product size closely, the maximum standard deviation σ being plus or minus 0.061-in. The maximum average variation necessary to include 90 per cent of his product was plus or minus 0.082-in. These size variations took care of all normal operating variables including differences in drying, shrinkage, degree of burn, etc.

This means that at least two-thirds of all the bricks varied less than 1/16-in. or 0.7 per cent from their brand average, and that at least 90 per cent of all bricks varied less than 1/12-in. or 0.9 per cent from their brand average.

Fig. 3 shows the actual individual length distribution patterns of the three brands of 9 × 4½ × 3-in. brick which were tested. Also included is the overall distribution pattern of the three brands taken together which represent the lengths of the brick which might go into any one open-hearth checker chamber.

It can be seen that if a steel plant were able to purchase 100 per cent of its checker brick requirements from a single plant of one particular refractories producer his troubles in laying "basket weave" checkers would be materially reduced. Unfortunately no steel plant is able to do this but must rely on several different manufacturers to supply its needs and therefore must be governed by the overall distribution pattern of Fig. 3.

The differences in the actual length averages of 9.08 − 8.97 or 0.11-in. between Sources A and B, 9.11 − 9.08 or 0.03-in. between Sources A and C and 9.11 − 8.97 or 0.14-in. between Sources B and C are caused by nothing more than faulty aim on die size on the part of the refractory manufacturers. From a comparison of the differences in average lengths from source to source with the standard deviation of the brick from each individual source as shown in Fig. 3, it is apparent that there is more variation between average brick size from different manufacturers than there is variation in individual bricks from any one manufacturer. This would seem to be brought about by the extreme tolerance of the present specification of the ASTM which allows 9-in. plus or minus 2 per cent on the length dimension. The data show that 9-in. plus or minus 1 per cent is sufficient to take care of normal operating variables and will include 92.2 per cent (all but 55 out of 704 samples) of all bricks measured when the brand averages are brought to exactly 9-in. See Fig. 4.

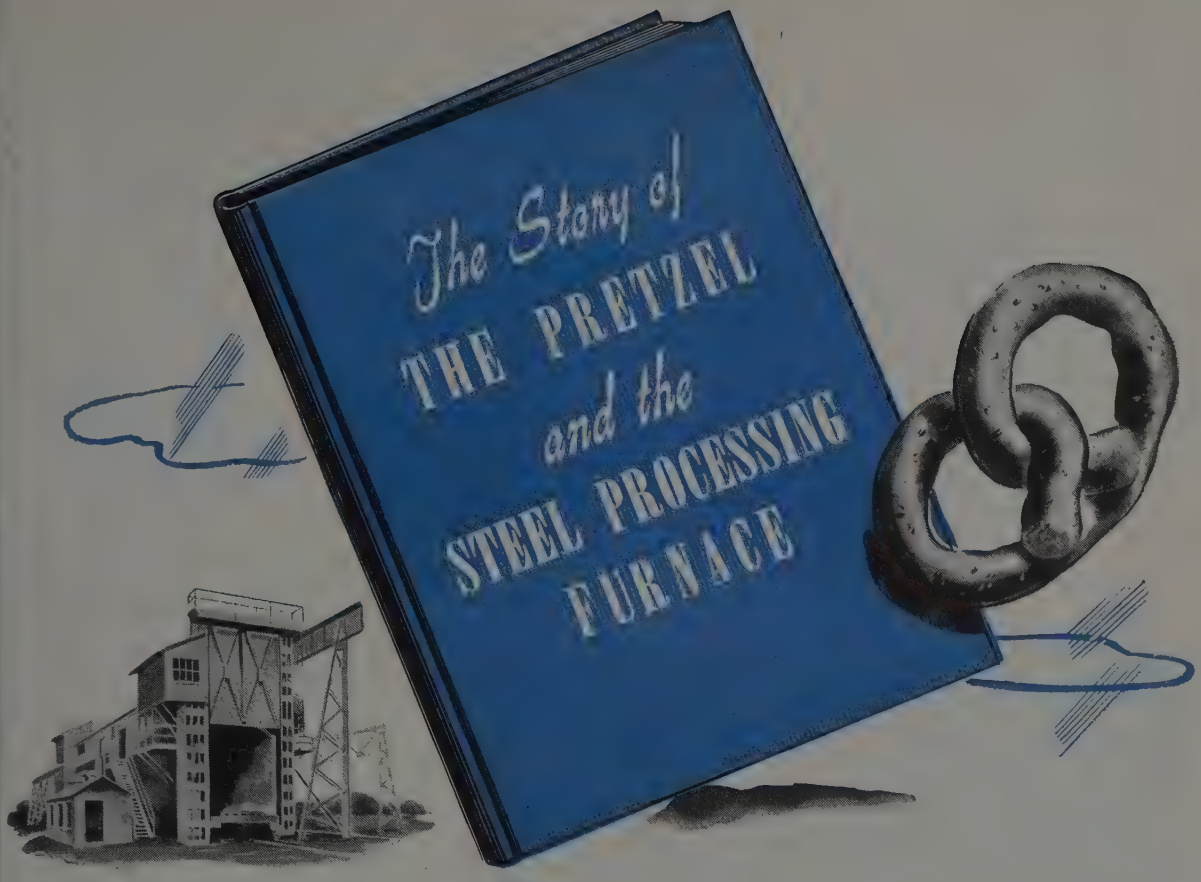
If proper die size control were exercised and the average size of all three brands of brick were brought to exactly 9-in., the distribution pattern would be as shown in Fig. 4. The standard deviation from the average which would include two-thirds of the individual bricks would be only plus or minus 0.056-in. ninety per cent of the bricks would be included in an allowable variation of 0.072-in. or 0.8 per cent while the ASTM specification of plus or minus 2.0 per cent takes in all but one of the 704 or 99.9 per cent of the measured samples. The problem of satisfactorily laying open-hearth "basket weave" checkers, with a minimum chance of flue stoppage, would be simplified to the same degree as though checker refractories were purchased from but one supplier if proper die control were exercised by all.

Induction Soldering

(*Concluded from Page 87*)

button mounted on the face of the cabinet, with provision for additional remote control stations if required. On production work such as this on which a definite time-heat cycle is pre-determined, the automatic timer de-energizes the unit after the time that has been set has elapsed.

A current transformer connected to the output terminals of the R-F generator is used to step up the current in the induction work coils resulting in a marked increase in heating rate. Protection of the generator is obtained by suitable circuit breakers, overload relays and flow switches. Protection for personnel is provided by electric interlocks on the doors of the generator unit.



You wouldn't think a pretzel had any relation to a steel processing furnace. But it does, and here's why:

A baking company recently lined a pretzel oven with B&W K-20 Insulating Firebrick. Immediate results—*50% reduction in baking time (6 minutes to 3 minutes) and over 57% reduction in heating-up time from a cold start (7 hours to 3 hours).*

Of course your business is different, but whether it's producing pretzels or processing steels in annealing, spheroidizing, forging, billet-heating, stress relieving or any other heating furnaces—it's B&W Insulating Firebrick that helps to do the trick better and more economically.

Because they are the lightest in their class, B&W I.F.B. have the lowest heat conductivity and lowest heat storage capacity. Furnaces lined with B&W I.F.B. come to operating temperature quickly, require less fuel to operate. This means cycle time is substantially cut: overall operating costs go down —production goes up.

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Induction Hardening

(*Continued from Page* 81)

(d) Presence of soft spots (pearlite) in the hardened zone.

(e) Formation of cracks during quenching, or subsequent tempering treatment.

(f) Pressure of high stresses at the surface or in the heat-affected zone adjacent to the hardened case, which may lower the service life of the induction-hardened part.

Later in this discussion, the importance of the various factors which influence induction hardening results will be considered. While examples used to illustrate most of the discussion will be parts hardened with a tube-oscillator operated at a frequency of 530,000 cycles per second, the principles are general, and for the most part, apply regardless of the type of oscillator used for hardening.

Skin Effect: Current density of an alternating current flowing in a conductor is not uniform across the diameter of the conductor, but is higher at the surface than at the core, as shown in Fig. 9. This concentration of the high-frequency current near the surface of a metal charge is called the "skin effect," and is responsible for the temperature gradient between the surface and core in an induction heated bar. The current I_x decreases with increasing distance, X, from the surface according to the following law:

$$I_x = I_0 e^{-x/\delta} \qquad (1)$$

in which I_0 is the surface current, and delta (δ) is the "effective depth of penetration of the current."

$$\text{when } x = \delta,\ I_x = \frac{I}{e} I_0 = 0.37\ I_0$$

Note in equation 1 that the current density curve is shifted toward the center of the bar as the value of δ increases. In other words, the degree of concentration of current at the surface increases when δ is decreased.

The depth of penetration, δ, varies with the frequency, F, the resistivity, ρ, and permeability, μ, as expressed by the following equation:

$$\delta = 1.98\sqrt{\frac{\rho}{\mu F}}\ \text{in.} \qquad (2)$$

where

ρ is the resistivity of the charge, microhm-cm.

F is the frequency, cycles per second.

μ is the permeability.

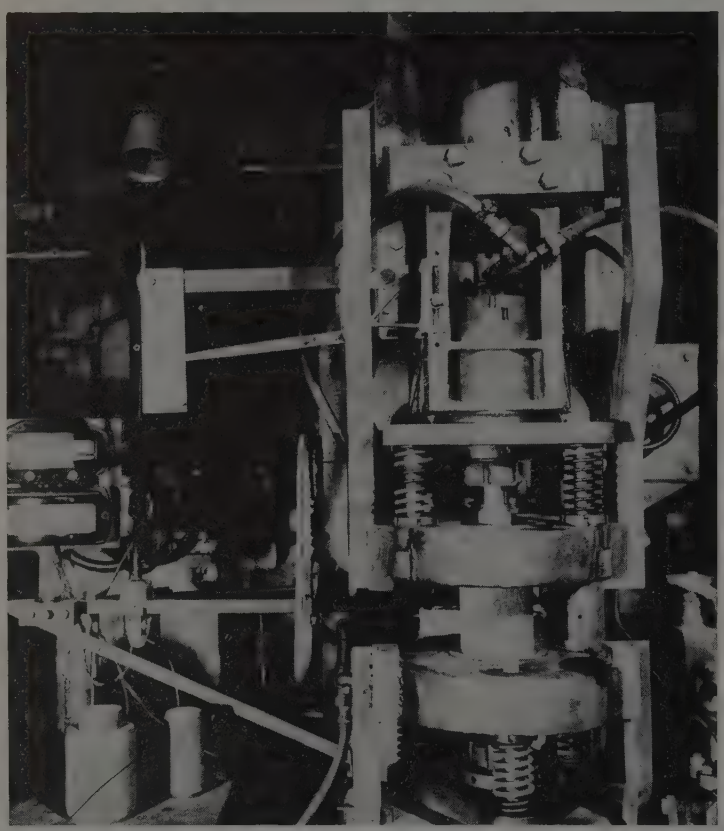
The resistivity and permeability are characteristics of the material which depend upon the temperature. Thus, if the material is specified, the values of ρ and μ are defined, and the frequency will have to be varied in order to alter the value of δ. The effect of these factors on the value of δ is shown in Fig. 11, where the depth of penetration is plotted against the frequency (on a log-log basis to produce a straight line) for several metals and alloys. The effect of varying the resistivity and permeability is indicated by the shift in position of the curves. For a constant value of frequency the depth of penetration will be increased with increasing resistivity and decreasing permeability.

The pronounced increase in depth of penetration of the current, which occurs when the metal is heated, is also shown for a 1045 steel in Fig. 11. The change in δ which occurs when the steel is heated from 15°C to 850°C is equivalent to the change which would occur if the frequency was decreased approximately one-one thousandth of its initial value. Thus, it is seen that the resistivity and permeability changes which occur during induction heating will tend to neutralize the effect of increasing frequency on the depth of penetration of the current.

It is important to emphasize that a great distinction exists between depth of hardening and depth of current penetration.

The depth of the current penetration is determined by equation 2 (this equation is, strictly speaking, for flat plates of infinite extent, but it is reasonably accurate for bars whose diameter is large compared to δ), whereas the depth of hardening is dependent upon intensity of the magnetic field, metallurgical response of the steel, heating time, and the temperature distribution curve. Current penetration is important in obtaining a shallow case, but only if the other factors are also favorable.

Power Input Into the Charge: Suc-



HOT POWDER METALLURGY: This standard hot press used by the Germans for making armor-piercing projectiles with cemented carbide cores was brought to this country recently to be installed in the powder metallurgy laboratory of Stevens Institute of Technology, Hoboken, N. J., for a Navy research program on high temperature alloys. Twelve pieces of machinery and associated apparatus comprising a complete hot powder metallurgy plant are to be set up at Stevens. The German equipment uses the hot pressing method by which heat and pressure are applied simultaneously to powdered metals

cessful surface hardening of many steel parts requires that the surface zone be heated rapidly, in order to reduce heating of the core by conduction of heat from the surface. To accomplish rapid heating by induction, the input of power into the surface zone must be high. The minimum requirement is about two kilowatts per square inch of the heated surface.

However, to obtain the minimum case depth in a given steel for a constant frequency, a concentration of power in excess of 100 kw per square inch may be required.

The amount of power (ΔP) dissipated in the surface layers of a material is given by equation 3 below.[2]

$$\text{where } \Delta P = \frac{H^2_t \sqrt{\rho\mu F}}{2\pi} \qquad (3)$$

where

P = power dissipated in charge.
H_t = tangential component of magnetic flux at surface of charge.
ρ = resistivity of charge.
μ = permeability of charge ($\mu = 1$ for nonmagnetic metals).
F = frequency.

Since the magnetic-flux density (H_t) is proportional to the ampere turns in the coil, the factor H^2_t in equation 3 would be replaced with I^2N^2 (times $\frac{1}{K^2}$, coupling or flux leakage constant) where I equals the coil current and N is the effective number of turns in the heating coil, and

$$\Delta P = \frac{I^2N^2 \sqrt{\rho\mu F}}{K^2 8\pi} \qquad (3a)$$

It is seen in equation 3a that the heat generated in the charge is proportional to the square of the ampere turns, but that it only varies with the square root of the frequency. Doubling the ampere turns is equivalent to a four-fold increase in frequency in its effect on heating rate. This explains why it is more effective to increase the heating rate by changing the ampere turns (indirectly the power output of the oscillator), than by changing the frequency.

The constant K in equation 3a is the coupling of flux leakage factor, and is a function of the distance of the charge from the heating coil. If the charge is close to the heating coil the efficiency of the energy transformation will be greater than when the distance between coil and charge is large. That is, the field strength will be at a maximum in the close vicinity of the heating coil and, therefore, for the maximum heating effect, the coil must be close to the work piece.

The importance of power output of the generator on the heating rate, and on the depth of penetration of temperature is shown in Figs. 10 and 12. In Fig. 10 it is seen that as the power output of the generator increases, the time to heat to a certain temperature decreases. It is clear that the longer heating period with the lower power will result in a deeper penetration of heat due to conduction from the surface to the center.

This is verified clearly in Fig. 12, where the steel was heated to the same surface temperature with different power. Sample A, heated with 180 kw, required less time, and therefore had a shallower penetration of heat than existed in sample B, which was heated with lower power. Comparison of these two curves illustrates clearly that depth of hardening is dependent upon power concentration as well as frequency. In other words, to obtain the full benefit of frequency in induction hardening it is necessary to also have a high concentration of power in the area being hardened.

(To be continued)

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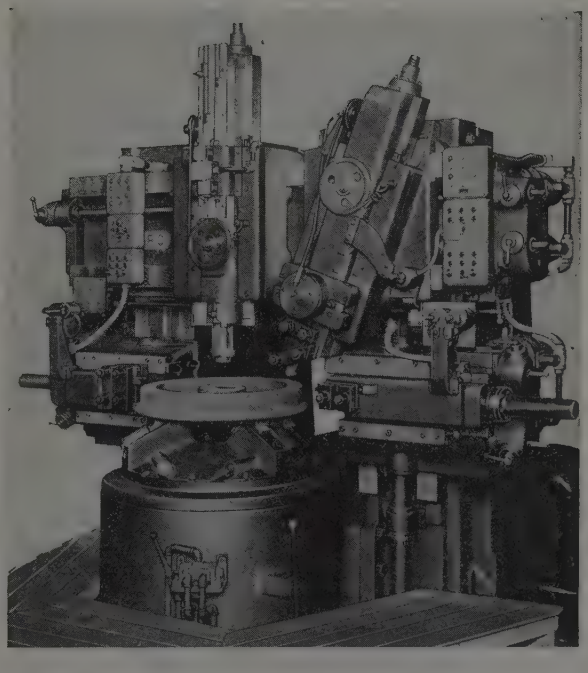
Machining Steel Car Wheels

SIX rolled steel car wheels per hour is the production rate for the new hypro automatic boring and turning mill recently developed by Cincinnati Planer Co., Cincinnati. By using a special chucking arrangement, center hole of wheel is bored simultaneously with machining of rim, flange and tread. Machine is designed to take wheel sizes from 33 to 40½-in.

The operator picks up the wheel with a hoist mounted on top of the machine, and lowers the wheel until it rests on the chuck seats. Chuck jaws come in contact with the wheel and lock it securely to the table. Next the four heads, namely, boring and facing, rim turning, and two side heads all traverse in to the wheel. Heads go into a feed change, feed through their operation and then automatically return to their starting positions.

Carbide tools with high negative rakes are used for all turning operations while tools of the boring and facing head are of high speed steel. All cuts are generated and in this manner finer finishes are said to be obtained as well as greater accuracy.

The boring and rim turning heads are equipped with Thymatrol motors electronically controlled and screw operated. Both side heads have General Electric contouring attachments to provide taper on the tread and flange of the wheel. The 100 hp main drive motor provides a table speed of 5 to 25 rpm.



Surface Finishes

(*Continued from Page* 82)

small shop and can be used to great advantage in improving product quality and reducing costs. In some of the more progressive plants this has already been accomplished.

One of the chief reasons that surface finish measurement still is considered in the class of laboratory technical hocus-pocus is because most of the articles on the subject have been written by research men who were searching for better ways to measure surface finish. They have dealt primarily with the technical details of investigations. Most of these hold little interest to the practical man. Usually these engineers or technicians have described instrumentation that at the outset appeared beyond the reach or need of the practical man's shop.

First we must find out why surface quality is important. An excellent answer is given by Mr. R. E. W. Harrison, vice president, Chambersburg Engineering Co.: "Surface quality control is even more important than rust prevention inasmuch as improper control of quality wears out more machinery than any other single factor. . . . Probably the one fact which accounts for the ability of the modern motor car to run one-hundred thousand miles with the same engine is the circumstance that better finishes under proper control are now applied to all wearing or loaded surfaces."

It is obvious that were it not for surface finish measurement instrumentation such "proper control" would be impossible. As a result the automobile industry has been one of the leaders in making such instrumentation pay its way —particularly where very finely finished surfaces are used. The products of the automotive industry could be improved even more by a further use of surface quality control and designation. At the same time they could reduce their costs by many hundreds of thousands of dollars per year by merely extending control to rougher surfaces and not doing any machine work finer than necessary.

Surface Finish Influences Life

It has been said and for many parts it is true that the quality of the surface finish may have a far greater influence upon the life and proper functioning of a part than either its composition, strength or dimensions. Since adequate controls are set up for these latter properties is it not reasonable to believe that the proper control of the surface finish would be even more worthwhile? This statement should not however, be construed to mean that super-smooth surfaces should be used everywhere. This is decidedly not the case. From an economic standpoint rougher surfaces cost less than smooth ones.

It is seldom good economy to make a surface smoother than it really needs to be, unless it can be finished at the same time another adjacent surface is finished or unless the only means of sizing will actually produce a smooth surface. The adoption of a proper drawing notation which will point out those surfaces of a part which need special care and a fine finish and those which can be allowed to remain rough will reduce costs by preventing misapplication of effort.

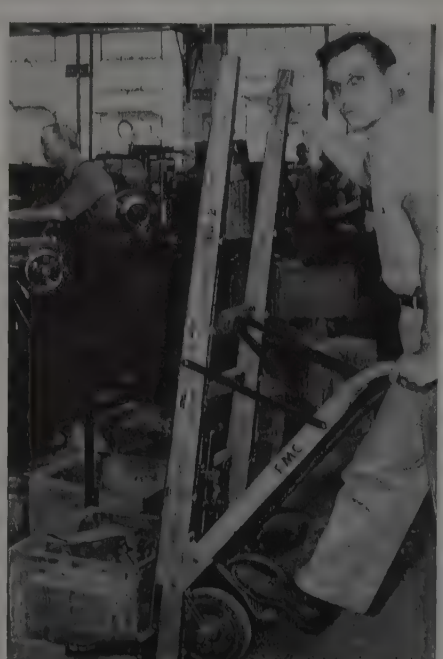
For example, suppose we consider a very simple part such as the piston and rod assembly of an hydraulic strut. If the old-time machinist were asked to make it he would undoubtedly have finished it smooth all over. He would take pride in its appearance and he would not consider a rough surface or a chatter mark acceptable shop practice. He might spend an hour turning and polishing the flat piston faces and an equal time on the rod itself.

To reduce costs and improve quality through the adoption of surface quality controls it must be determined which surfaces are critical and which are not. The designer is best able to determine these facts at the time the drawing is made. In this example the rod itself must slide through a packing gland and must therefore be smooth. The outside diameter of the piston must also be smooth since it slides along the inside of the hydraulic cylinder, but it need not be as smooth as the rod since it is always well lubricated and slides against a smooth metal cylinder bore. The rod however must slide against a soft packing and may be dry and dusty when retracted.

The only other surfaces of importance are the packing ring groove in the piston head and the mating surfaces that attach to the machine driven by the strut. The two flat faces of the piston can be as rough as normal rapid machining processes will leave them since they only contact the hydraulic fluid or stop against the strut ends at full stroke.

It would therefore be advisable to inform the machinist and inspector of these facts by designating the required surface quality for each surface of the part by calling out roughness values on the drawing. Such roughness numbers indicate the maximum allowable average surface roughness in microinches as indicated by either an instrument or by fingernail comparison with standard roughness blocks having known roughness values.

From these notations the machinist will know at once that the piston rod must be very smooth, the ring groove not quite as smooth, the piston diameter just smooth but the flat ends of the piston can be rough. He will therefore put the time into the surfaces that need special care and let the rest go. Of course they must still be held to proper dimensional tolerances. Even on one simple part, time and effort can be saved,



CLAMP TRUCK: equipped with short, powerfully-tipped "arms" at its base, this one-man clamp truck can lift a loaded box or boxes weighing from 300 to 600 lb. The squeeze is applied by the operator as he steps on the pedal. Unit was designed to supplement work of power lift trucks in solving the problem of in-plant movement of materials. It is being produced by Food Machinery Corp., Riverside, Calif.

Kodak

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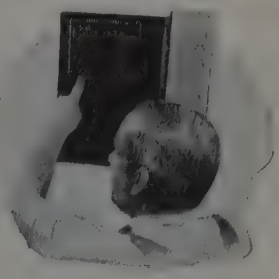

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and the part is better for the use of a roughness designating system and better control.

There are many parts where it would be almost impossible for anyone but the designer to know which surfaces are critical and which are not. If the designer designates the required finish for the critical surfaces and gives a generous overall roughness allowable for the noncritical ones savings will accrue all along the line, or for equal cost more perfect critical surfaces can be prepared which will improve product quality and life.

Qualities Affected By Changes

There are many other reasons why surface finish control is important but they can only be mentioned here. Among the qualities that are affected by changes in surface roughness we might include:

(1) Life—how long will it last?—Remember friction, abrasion, wear, lubrication, bearing area, corrosion and galling.

(2) Safety—how strong is it?—Remember stress concentrations, fatigue strength, notch sensitivity and imposed loads.

(3) Function—Will it work properly?—Must it slide freely, fit properly, prevent leakage, serve as a bearing, as a mating part or rub over packings without damaging them?

(4) Appearance—does it look good?—How about adhesion of plating or other protective coatings such as paint? (Is appearance important?)

(5) Heat transmission—rough surfaces are good radiators and heat absorbers, smooth surfaces serve better as insulators.

(6) Are optical properties important—Mirrors, and lenses,—transmission—reflection—refraction of light or heat?

It appears as though a tradition has been built up in the instrument industry that all surfaces on parts must be finished to perfection. Often that may account for what outsiders may consider an unjustifiably high cost. Users of instrumentation will usually agree that it is more important that an instrument operate properly and dependably than that it look pretty. Unless the surface finish is essential for proper functioning it is wasted. Proof of quality lies in performance. Waste can never be justified. Of course an attractive case and neat design help sell the instrument and they may be justified, but it would be advisable to be watchful against wasted effort that does no one any good.

Even those who do not make machines or parts to sell often manufacture special processing machinery for use in their own plants. Surface quality control is just as important to them as it is to others. A list of users would include almost every conceivable industry from cosmetics through breakfast foods and railroads to aircraft and paper mills.

When we speak of surface finish measurement instrumentation we refer to all devices that may be used in controlling the surface quality of parts or products whether machined or produced by any other process. While it is true that most of the emphasis has been placed on controlling the surface quality of machined parts it is often even more important that the surface quality of the product be held to conformance with certain roughness standards. Two recent inquiries that come to my mind were in connection with controlling the roughness of a plastic wire covering that was extruded onto the wire and one for controlling the grain of lithographic plates. It seems that there is no standard of roughness in the plate making industry and each manufacturer has his own arbitrary scale for determining the degree of roughness of his plates. Measurement instrumentation and roughness replicas for fingernail tactual comparison can be made for almost any purpose.

Will Control Pay?

The question of the practical man, management, the shop superintendent, the chief engineer, the machine shop foreman, the inspection department, is whether surface quality control can show a profit for them. Will it pay its way? Will their product be better and will costs be cut if they use it? They don't care whether surface finish is measured in microinches or flubdubs. They don't care whether the instruments are accurate or not, as long as they all give the same roughness reading on the same surface. Of course national standardization would appeal to them for then all of their suppliers and their customers would have a mutual understanding of what is meant by each designated surface roughness.

When their drawings are sent out for bids, the subcontractor would know what finishes were wanted. Engineering, inspection and shop would not need to spend hours arguing about whether the finish of a part in process was satisfactory or not. The manufacturing department could use any process they wished as long as they obtained the required finish.

There are so many different types of surfaces that it would be impossible even to count them. To the naked eye, we have the surfaces of a wire mesh screen, the plastered wall, the granite building, an alligator's skin, fuzzy peach and many others, each completely different. When we take a small magnifier we find almost everything we own has a characteristic surface texture. Consider as examples pieces of paper, leather, canvas, cloth, wood, linoleum, wallboard. Each is different from the other. Even by the eye alone it is easy to distinguish between the machine finishes produced by milling, turning, lapping, honing, grinding, etc., as each process leaves a different characteristic surface roughness. When we consider that there are not only so many different types of surfaces, but also many degrees of roughness for each it is not surprising that no one has yet found a surface finish measuring instrument that can begin to do the whole job.

Consider All Measuring Devices

Surface finish measurement instrumentation should be considered to include not only commercially available instruments such as tracer point analysers, optical comparators, reflectivity or gloss meters and sample roughness blocks, either originals or replicas, but also all other devices for the purpose that have been used experimentally.

Tracer point analysers have contributed more to the advancement of surface quality control than any other single factor. With all their precision as instruments, however, a recent unbiased study conducted by the National Bureau of Standards and the Army Ordnance Department showed that their readings are not always consistent or dependable over a wide range of surfaces. The fact that the tracer point itself induces certain errors due to its inability to precisely follow all of the surface irregularities, plus inherent differences in the response characteristics of the pickups, amplifiers and meters involved makes duplication of results quite difficult. There is still much room for improvement.

It is this inability to duplicate readings that is delaying national standardization of surface roughness for machined parts. No one has yet designed a surface roughness measuring instrument that can be produced in quantity and yet maintain its accuracy or calibration so that they will all give the same reading on any given surface. The problem is not an easy one.

Another consideration is that no generally acceptable criteria have ever been evolved that will truly correlate the performance of different machine finishes. This is largely due to the fact that so many factors are involved. Different materials, various types of finishes and thousands of applications make the problem of correlating performance more difficult.

Further, no agency has ever taken over a project to make a thorough and careful study of the results and observa-

tions of the many investigators. No attempt has ever been made to correlate them, to make tests to confirm or discount their findings, or to determine if there might be a sound fundamental basis on which such performance can be measured and predicted. Such a program might well fit into the research facilities of a large university if industry is willing to help finance the project and take enough interest in it to assist and guide its work so that the results will be worthwhile.

As a result, it is doubtful if the so-called rms (root-mean-square) average deviation from the mean in microinches (which is the generally acceptable unit for machine finish designation) is really any good, or for that matter any better than the ordinary arithmetical average as an index to the roughness of any machined surface. At the present time, the trend is toward forgetting the rms complication and using the arithmetical average until a really suitable index to performance has been evolved from tests on representative surfaces whose roughnesses are adequately known. Until research establishes the best index, surface finish measuring instruments will have to base their readings on existing units.

Arithmetical Average Preferred

A recent survey conducted among the leading aircraft manufacturers by the National Aircraft Standards Committee revealed a preference for using the arithmetical average of by a vote of 21 to 2. This preference was solicited in the interest of simplification, since it appears that the difference between the two units is less than the acceptable tolerances and within the accuracy range of existing instrumentation.

The practical man should not allow these facts to worry him unduly for with any given instrument he can control the processing of his product within extremely close limits. By making samples of the surfaces that have given satisfactory performance, he can, by direct instrument comparison, keep all further production under control. This is particularly true for very fine surfaces that are very essential to the continued satisfactory performance and life of his product. The Profilometer, manufactured by Physicists Research Co., Ann Arbor, Mich., and the surface analyser manufactured by the Brush Development Co., Cleveland, are tracer point surface finish measuring instruments suitable for such work. The surface finish comparator manufactured by the Comptor Co., Waltham, Mass., is one of the reflectivity or glossmeter types of comparators. It is equipped with a light source and a photoelectric cell which measures the light reflected from the surface to be compared with the sample. The meter reading serves as an index to the surface roughness. It is also quite suitable for very finely finished parts.

While nothing will take the place of these precision instruments in measuring or shall we say comparing the surface roughness of very fine machine finishes, there are many rougher surfaces that also need adequate control in the shop.

Samples Distributed

Many manufacturers have found that the procurement of sets of standard surface finish samples for distribution to their workers have solved the problem as far as the average machine finishes are concerned. This can usually be done for an expenditure of considerably less than one hundred dollars if the plant is not too large, whereas even one tracer point analyser costs over a thousand dollars. In many cases, even such an expense is justified as some manufacturers have dozens of tracer point analysers in one department. In other cases, it may not be justified and for those the use of standard roughness samples accomplishes the required control.

Both methods, however, require the use of a proper system of drawing designation. One method now in use by industrialists all over the world is described in the text "Control of Surface Quality" available from the Surface Checking Gage Co., Hollywood, Calif. Such a method of drawing designation and quality control can be accomplished by using as reference standard roughness samples. There are several types available and any of these that appeal to the user can be used in such a program. Those of the University Machine Co., Cambridge, Mass., are among the best stainless steel machined specimens obtainable for purposes of comparison. The Norton Co., Worcester, Mass., makes an excellent set of surface roughness standards depicting various grinding finishes that are also the original machined samples.

Replica Standards Manufacturers

In the field of replica standards there are several manufacturers:

General Electric Co., Schenectady, N. Y.

U. S. Rubber Co., Electroforming Dept., Detroit.

Surface Checking Gage Co., Hollywood, Calif.

N-H Gage Co., North Hollywood, Calif.

These replica standards have many advantages too. Their lower cost permits a wider distribution, hence it is easier for all personnel along the line to check conformance with surface finish requirements. The engineer, inspector, machinist, assembler and everyone connected with the control of surface quality can easily, by finger nail comparison of the parts with the samples, tell if the parts are satisfactory insofar as surface finish is concerned.

Comparison is made by drawing the finger nail lightly across the surface of the standard roughness specimen prepared by a similar process and then across the machined surface of the part whose roughness limits are being checked. It is easy to tell which of the two surfaces is the rougher. By comparison with another of the standard roughness blocks, the finish of the part can be closely estimated.

Fingers Detect Roughness

Many times it has been shown that even an inexperienced person can immediately detect a difference of only a few microinches on some types of surfaces. It might be said that, when used in conjunction with a standard set of surface roughness blocks, each finger is equally sensitive to an instrument worth over one thousand dollars. Each worker having ten fingers carries about ten thousand dollars worth of surface finish measurement instrumentation with him. All the practical man must do to use this abundant supply of instrumentation is to train his workers properly, adopt an acceptable method of drawing designation and supply the roughness standards for reference. For the rougher surfaces that are not critical from a performance standpoint, visual comparison with the standard surfaces has proved sufficiently accurate.

There are many other methods for evaluating surface finish that have not been successful enough to leave the laboratory. Others have helped immeasurably in certain applications.

Among these may be mentioned taper sectioning; the use of a phonograph pickup for comparison; optical sectioning by a straight edge shadow; film replicas for projection; taper sectioning by inclined light beam; air leakage or light leakage between the surface and a standard orifice; friction tests; oil adhesion tests; and the honing stick test.

Surface finish measurement instrumentation has already contributed a great deal toward the improvement of the science of interchangeable manufacture. With proper application, it can easily contribute a great deal more. With such great opportunities ahead for improved instrumentation, as well as improved utilization, the day may be not far off when surface finish control will be as universal as the use of dimension control is today.

The Business Trend

Production Tempo Rises After Yearend Slowdown

INDUSTRIAL production is gaining momentum after the customary slowdown of the yearend holiday period. First step in the recovery was reflected in a 7-point rise on STEEL's industrial production index for the week ended Jan. 4, compared with the preceding week. The increase was scored notwithstanding New Year's Day, for industry worked more days in the week ended Jan. 4 than in the Christmas holiday week.

The 7-point rise put the index at 137 per cent (preliminary) of the 1936-1939 average of 100, compared with 155 per cent in the week before the holidays started.

STEEL—Helping boost the industrial production rate is steel ingot output, which now is back up to approximately 90 per cent of capacity, nearly equalling the postwar high.

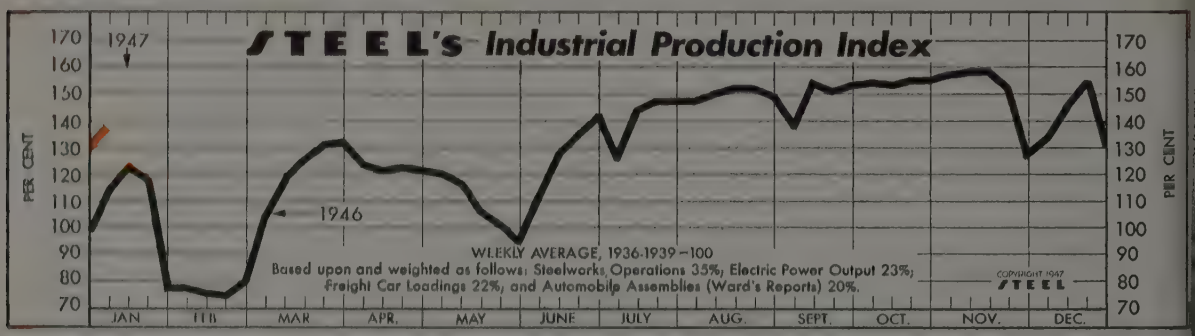
AUTOS—On the other hand, production of 56,919 passenger automobiles, trucks and busses in the week ended Jan. 4 was the lowest since the first week of last July. While part of the latest decline stemmed from the yearend holidays and absenteeism, a substantial portion resulted from shortages of materials, particularly steel, the latter reported as the No. 1 bottleneck in auto plants.

OUTLOOK—Business appears to be gaining stability and in this respect is better than at any time in the last year, says the National Association of Purchasing Agents, New York. Business volume may decline somewhat, but what remains will be on a sounder basis, the group believes.

CONSTRUCTION—Always a buoyant factor in the economy, construction is expected to provide considerable strength to business in 1947. In line with that expectation comes word from the building and engineering firm, the Austin Co., Cleveland, that it anticipates a record volume of private industrial construction this year. Manpower and material shortages will be largely corrected in 1947, the company believes. However, upward trend in costs in 1946 carried the Austin company's industrial building cost index from the third quarter's 152 per cent of the 1926 average of 100 to 155 in the fourth quarter.

CARLOADINGS—High level of railroad carloadings is expected to continue and put total loadings in the first quarter of this year 8.8 per cent ahead of the corresponding period of 1946. Although loadings of some nondurable goods will make gains the greatest jumps are expected in loadings of durable goods, the production of which is expected to show considerable increases over last year. In 1946, loadings of revenue freight totaled 41,341,205 cars, a 1.4 per cent gain over 1945.

BUSINESS HIGHLIGHTS—Income payments to individuals rose to $164 billion in 1946 from $161 billion in 1945, U. S. Commerce Department reports. It also says consumer spending for goods and services reached record dollar total of $127 billion, almost 20 per cent above 1945 and more than 67 per cent above prewar peak year of 1941. Also, consumer spending for automobiles, radios, electrical appliances, furniture and other durable goods reached a record high of $14 billion in 1946.



The Index (see chart above): **Latest Week (preliminary) 137** **Previous Week 130** **Month Ago 134** **Year Ago 114**

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)†	88	77	60.5	81
Electric Power Distributed (million kilowatt hours)	4,573	4,442	4,673	3,865
Bituminous Coal Production (daily av.—1000 tons)	1,520	2,183	342	1,207
Petroleum Production (daily av.—1000 bbls.)	4,649	4,713	4,695	4,548
Construction Volume (ENR—Unit $1,000,000)	$61.9	$34.3	$105.4	$43.3
Automobile and Truck Output (Ward's—number units)	56,919	67,070	93,907	13,920

* Dates on request. † 1946 weekly capacity was 1,762,381 net tons

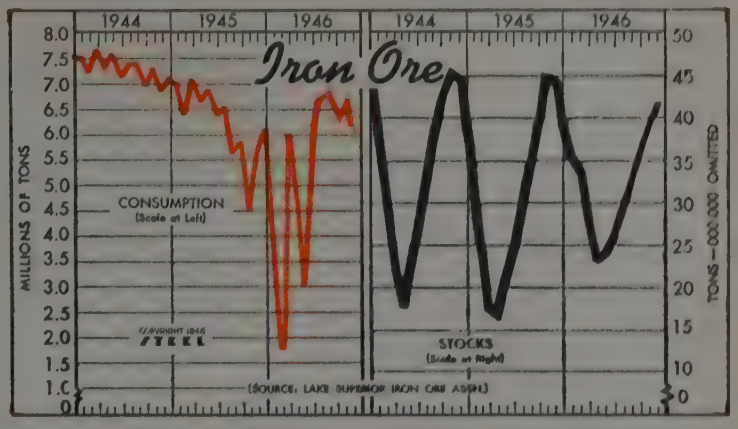
TRADE				
Freight Carloadings (unit—1000 cars)	675†	628	729	652
Business Failures (Dun & Bradstreet, number)	30	38	37	18
Money in Circulation (in millions of dollars)‡	$28,951	$29,163	$28,906	$28,491
Department Store Sales (change from like wk. a yr. ago)‡	+76%	+26%	+3%	+28

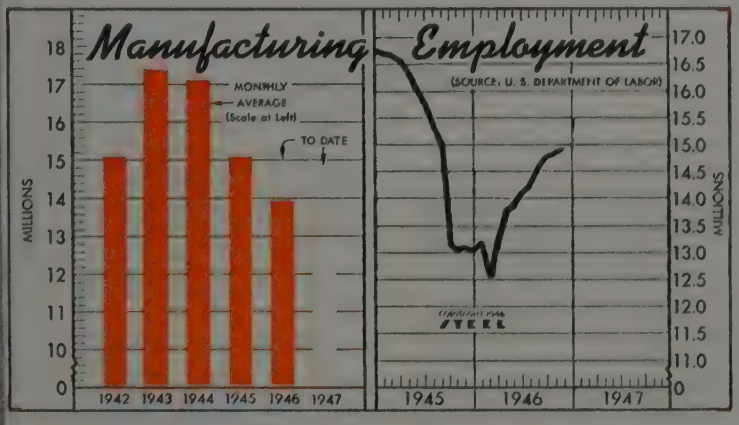
† Preliminary. ‡ Federal Reserve Board.

Iron Ore

(Lake Superior Iron Ore Assn.)
Gross tons—000 omitted

	Consumption		Stocks at Lake Erie Docks and furnaces	
	1946	1945	1946	1945
Jan.	3,719	6,983	35,342	30,889
Feb.	1,718	6,371	33,647	24,577
Mar.	6,021	7,082	27,601	17,304
Apr.	4,769	6,412	23,079	16,429
May	2,990	6,872	23,905	20,715
June	4,995	6,397	26,265	24,847
July	6,460	6,532	30,439	29,485
Aug.	6,738	5,658	34,067	34,781
Sept.	6,380	5,837	37,573	39,549
Oct.	6,625	4,491	40,435	45,090
Nov.	6,131	5,611	41,918	44,706
Dec.	....	6,099	.....	39,059
Total	....	74,576	.....	.....





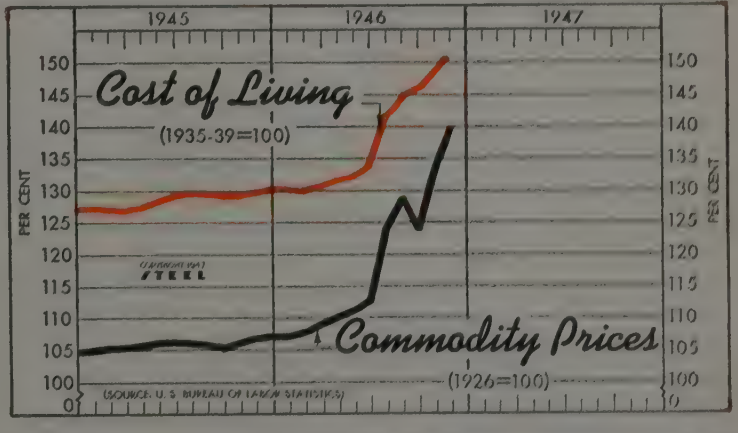
Factory Employment

(000 omitted)

	1946	1945	1944
January	13,236	16,696	17,587
February	12,536	16,684	17,581
March	13,206	16,557	17,447
April	13,779	16,302	17,235
May	13,885	16,012	17,105
June	14,098	15,749	17,116
July	14,245	15,331	17,091
August	14,578	15,019	17,085
September	14,731	15,159	16,888
October	14,761	15,048	16,758
November	14,982	15,110	16,695
December	.....	15,059	16,747
Monthly Ave.	.....	15,960	17,111

Wholesale Commodity Price—Cost of Living Indexes

	—Commodities— (1926=100)			—Living Cost— (1935-39=100)		
	1946	1945	1944	1946	1945	1944
Jan.	107.1	104.9	103.3	129.9	127.1	124.2
Feb.	107.7	105.2	103.6	129.6	126.9	123.8
Mar.	108.9	105.3	103.8	130.2	126.8	123.8
Apr.	110.2	105.7	103.9	131.1	127.1	124.6
May	111.0	106.0	104.0	131.7	128.1	125.1
June	112.9	106.1	104.3	133.3	129.0	125.4
July	124.3	105.9	104.1	141.2	129.4	126.1
Aug.	129.1	105.7	103.9	144.1	129.3	126.4
Sept.	124.0	105.2	104.0	145.9	128.9	126.5
Oct.	134.1	105.9	104.1	148.4	128.9	126.5
Nov.	139.6	106.8	104.4	151.7	129.3	126.6
Dec.	....	107.1	104.7	....	129.9	127.0
Ave.	....	105.8	104.0	....	128.4	125.5



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$12,199	$12,782	$11,911	$11,936
Federal Gross Debt (billions)	$259.5	$262.6	$262.4	$278.7
Bond Volume, NYSE (millions)	$33.6	$21.0	$29.3	$27.1
Stocks Sales, NYSE (thousands)	5,157	5,120	6,116	5,054
Loans and Investments (billions)†	$56.2	$56.9	$57.8	$67.7
United States Gov't. Obligations Held (millions)†	$35,831	$36,559	$37,859	$48,541

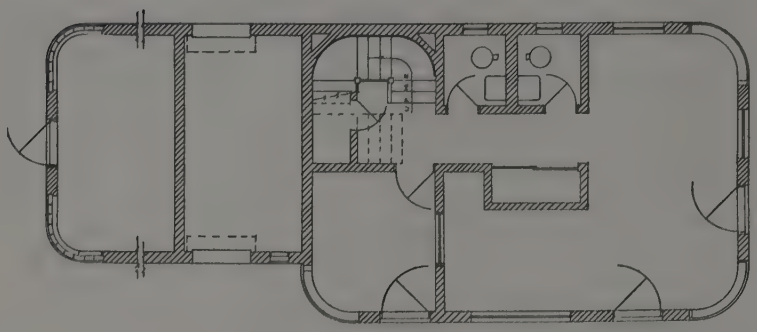
† Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$67.82	$64.91	$64.45	$58.27
All Commodities†	139.6	139.8	139.1	107.0
Industrial Raw Materials†	154.2	155.5	154.8	120.6
Manufactured Products†	134.5	134.2	134.1	102.6

† Bureau of Labor Statistics Index, 1926=100.

Save time, labor, materials with these short cuts in drafting!



1. UNNECESSARY DRAFTING ELIMINATED

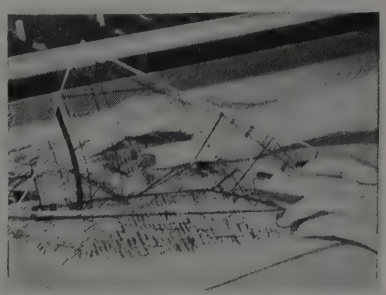
Assume that you want additional tracings of the above floor plan so that you can add the plumbing layout to one copy, the air-conditioning layout to the next, and so on.

With Ozalid, you need never redraw your original tracing! Just make translucent Ozalid Intermediate prints of it . . . and on these, add the individual details in pencil or ink. Then from each "Intermediate" you can produce the desired number and type of positive OZALID PRINTS.

This is just one example that probably suggests dozens of uses for Ozalid in your everyday work!

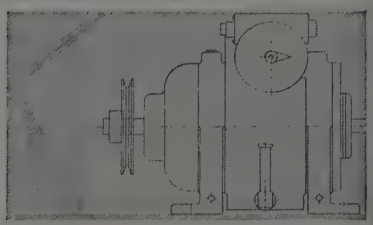
2. SEPARATE DESIGNS COMBINED

The extreme transparency of Ozalid foil permits the production of composite prints, which are generally made to show the relationship of separate design details to each other.

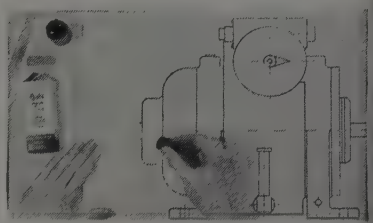


To do this, you merely make a foil print of each tracing . . . then overlay the foils in the desired position on Ozalid sensitized material . . . and feed into your Ozalid machine.

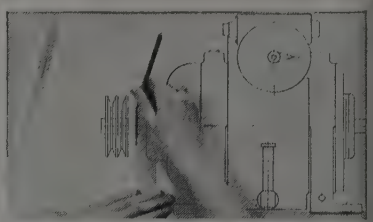
3. OBSOLETE DETAILS REMOVED



• This is an Ozalid Intermediate (translucent) print of the original drawing.



• Draftsman eradicates obsolete lines with quick-drying OZALID CORRECTOR FLUID.



• New design is drawn in. Any number of prints can now be made from this up-to-date "Master."

SEE the 10 different types of Ozaprints you can make. Learn all about the new Ozalid Streamliner! Write today for free booklet No. 201.

NEW OZALID STREAMLINER

. . . Designed for Average Printmaking Requirements!

This completely new, moderately priced machine gives you these five extra values in *printmaking* at no extra cost:

Efficiency: You get positive (not negative) prints direct from your tracings in *two* simple steps: Exposure and Dry Development.

Speed: Your prints are delivered completely dry, ready for use in only 25 seconds.

Economy: An 8½ x 11" print costs one cent; 11 x 17", two cents. You can make prints up to 42 inches wide, any length. Your Streamliner requires only 11 sq. feet of floor space.

Versatility: The lines and images on your originals can be reproduced in black, blue, red, sepia, yellow . . . on paper, cloth, foil, film, or plastic. All prints are made in *same manner* . . . simply choose type of Ozalid material best for job at hand.

Simplicity: Anyone can be the operator. Prints are delivered on top, stacked in order, within easy reach.

OZALID

DIVISION OF GENERAL ANILINE AND FILM CORPORATION

Johnson City, N. Y.

Ozalid in Canada—Hughes Owens Co., Ltd., Montreal

Semifinished Steel, Plate And Shape Prices Advance

Latest actions taken by leading producers bring current cycle of adjustments close to completion . . . National steel ingot rate rises to 90 per cent

STEEL price structure continues to undergo broad revisions, including various changes in extras long overdue and designed to set up numerous heretofore unprofitable operations on a sound basis. However, the cycle of price adjustments which started early last month is nearing completion, the latest actions being taken by leading producers last week on semifinished material, shapes and plates.

All individual companies have not yet completed their new price schedules but these are being prepared for publication soon. Minor details of the general price structure also must be worked out, such as the arbitrary delivered prices at Detroit and eastern Michigan, as well as delivered prices on some products to other consuming centers to reflect the authorized increases in freight rates.

While consumers, as a result of the price changes, are being confronted with stiff increases in some lines, most of them realize the need for adjustment, especially in view of mounting mill costs over recent years. Many of these increases had not been reflected in price schedules and the consumers believe that they themselves stand to benefit in the long run through better servicing by producers, particularly on various items which have been scarce for months because they could not be produced profitably. The mills have also taken this opportunity to correct many uneconomic practices which had been adopted in recent years, including phantom basing points, nonenforcement of some published charges, etc.

The following summarizes actions taken last week on semifinished material: Carbon steel ingots have been advanced to as much as $60 per gross ton from $33; billets, blooms and slabs to as much as $60 from $39 to $47; sheet bars, up to $66 compared with the old OPA ceiling of $38; and skelp, up $6 a ton to the basis of $2.35 per 100 pounds. Carbon steel tube rounds advanced $7 a ton to $64. While all of these higher levels have not been established on an industry-wide basis, the movement is wide enough to justify an advance in market quotations.

In the finished steel classification, plate and shape base prices were advanced generally $3 a ton to 2.65c and 2.50c, Pittsburgh, respectively. Some of the leading producers advanced tight cooperage hoop prices $5 a ton, slack barrel hoop prices an average of $16.40 a ton, and tobacco hogshead hoop prices an average of $2.59 per 100 hoops. Bolt and nut market has become established at higher levels following several weeks during which a wide range of prices was quoted. Scrap prices were fairly steady last week, as buying resistance to the uptrend crystalized.

STEEL's composite market price averages rose to $51 from $41.60 on semifinished and to $68.45 from $67.91 on finished steel while holding unchanged at $29.56 on steelmaking pig iron and $31.17 on steelmaking scrap.

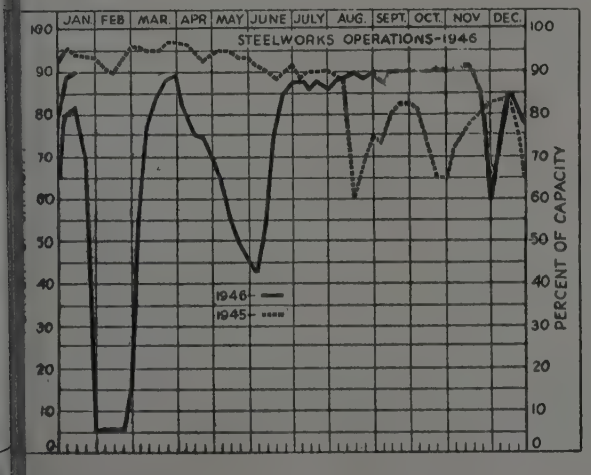
Ingot operations rose two points further last week to 90 per cent of capacity, signalizing the return to the rate which prevailed prior to the coal strike and holiday shutdowns. The rate advanced 6 points at Youngstown to 84 per cent of capacity, 6 points to 92 per cent at Detroit, 5 points at Cleveland to 92 per cent, 4½ points to 72½ per cent at St. Louis, 4 points to 82 per cent in eastern Pennsylvania, 3 points to 89 per cent at Wheeling, 2 points to 98 per cent at Pittsburgh, and 1 point to 89½ per cent at Chicago. The rate eased 5 points to 84 per cent in New England and 2 points to 80 per cent at Cincinnati while holding unchanged at 99 per cent at Birmingham and 90½ per cent at Buffalo.

DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week Ended Jan. 11	Change	Same Week 1946	Same Week 1945
Pittsburgh	98	+ 2	89.5	89
Chicago	89.5	+ 1	88	98.5
Eastern Pa.	82	+ 4	80	95
Youngstown	84	+ 6	85	81
Wheeling	89	+ 3	95	98.5
Cleveland	92	+ 5	84	86
Buffalo	90.5	None	81	70
Birmingham	99	None	95	95
New England	84	− 5	80	92
Cincinnati	80	− 2	81	92
St. Louis	72.5	+ 4.5	68	75
Detroit	92	+ 6	88	84
Estimated national rate	90	+ 2	82	94

Based on weekly steelmaking capacity of 1,762,381 net tons for 1946; 1,831,636 tons for 1945; 1,791,287 tons for 1944.



COMPOSITE MARKET AVERAGES

	Jan. 11	Jan. 4	Dec. 21	One Month Ago Dec., 1946	Three Months Ago Oct., 1946	One Year Ago Jan., 1946	Five Years Ago Jan., 1942
Finished Steel	$68.455	$67.91	$64.91	$64.75	$64.45	$58.27	$56.73
Semifinished Steel	51.00	41.60	41.60	41.10	40.60	37.80	36.00
Steelmaking Pig Iron	29.56	29.56	29.56	29.10	27.50	24.75	23.00
Steelmaking Scrap	31.17	31.17	31.08	27.68	19.17	19.17	19.17

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire, nails, tin plate, standard and line pipe. **Semifinished Steel Composite:**—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. **Steelmaking Pig Iron Composite:**—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago Cleveland, Neville Island, Granite City and Youngstown. **Steelworks Scrap Composite:**—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; others, gross tons.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished material (except tin plate) and wire rods, cents per lb; coke, dollars per net ton; others, dollars per gross ton.

Finished Material

	Jan. 11, 1947	Dec., 1946	Oct., 1946	Jan., 1946
Steel bars, Pittsburgh	2.60c	2.55c	2.50c	2.25c
Steel bars, Philadelphia	2.98	2.91	2.86	2.57
Steel bars, Chicago	2.60	2.55	2.50	2.25
Shapes, Pittsburgh	2.50	2.35	2.35	2.10
Shapes, Philadelphia	2.64	2.48	2.48	2.215
Shapes, Chicago	2.50	2.35	2.35	2.10
Plates, Pittsburgh	2.65	2.50	2.50	2.25
Plates, Philadelphia	2.85	2.558	2.558	2.30
Plates, Chicago	2.65	2.50	2.50	2.25
Sheets, hot-rolled, Pittsburgh	2.50	2.48	2.425	2.20
Sheets, cold-rolled, Pittsburgh	3.20	3.19	3.275	3.05
Sheets, No. 10 galv., Pittsburgh	3.55	3.675	†4.05	†3.70
Sheets, hot-rolled, Gary	2.50	2.481	†2.425	†2.20
Sheets, cold-rolled, Gary	3.20	3.21×	3.275	3.05
Sheets, No. 10 galv., Gary	3.55	3.675	†4.05	†3.70
Hot-rolled strip, Pittsburgh	2.50	2.462	2.35	2.10
Cold-rolled strip, Pittsburgh	3.20	3.162	3.05	2.80
Bright basic, bess, wire, Pittsburgh	3.30	3.05	3.05	2.75
Wire nails, Pittsburgh	3.75	3.75	3.75	2.90
Tin plate, per base box, Pittsburgh	$5.75	*$5.25	*$5.25	$5.00

* Nominal. † Base changed in December to 10 gage.

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$55.00	$38.00	$38.00	$36.00
Slabs, Pittsburgh, Chicago	51.00	39.00	39.00	36.00
Rerolling billets, Pittsburgh	51.00	39.00	39.00	36.00
Wire rods ¼ to 7/32-inch, Pitts.	2.55c	2.425c	†2.30c	†2.15c

† Base changed in December.

Pig Iron

	Jan. 11, 1947	Dec., 1946	Oct., 1946	Jan., 1946
Bessemer, del. Pittsburgh	$31.83	$31.77	$29.77	$26.94
Basic, Valley	30.00	29.50	28.00	25.25
Basic, eastern del. Philadelphia	32.01	31.93	29.93	27.09
No. 2 fdry., del. Pgh. N. & S. sides	31.33	31.27	29.27	26.44
No. 2 fdry., del. Philadelphia	32.51	30.43	30.43	27.59
No. 2 foundry, Chicago	30.50	30.00	28.50	25.75
Southern No. 2, Birmingham	26.88	26.88	24.88	22.13
Southern No. 2, del. Cincinnati	*30.94	30.94	28.94	26.05
Malleable, Valley	30.50	30.00	28.50	25.75
Malleable, Chicago	30.50	30.00	28.50	25.75
Charcoal, low phos., fob Lyles, Tenn.	37.50	37.50	33.00	33.00
Gray forge, del. McKees Rocks, Pa.	31.01	30.61	28.61	25.80
Ferromanganese, fob cars, Pittsburgh	140.00	140.00	140.00	110.00

Scrap

Heavy melting steel, No. 1, Pittsburgh	$32.50	$28.50	$20.00	$20.00
Heavy melt, steel, No. 2, E. Pa.	31.00	27.38	18.75	18.75
Heavy melting steel, Chicago	30.00	27.188	18.75	18.75
Rails for rolling, Chicago	34.75	31.00	22.25	22.25
No. 1 cast, Chicago	40.00	36.875	25.00	20.00

Coke

Connellsville, furnace ovens	$8.75	$8.75	$8.75	$7.50
Connellsville, foundry ovens	10.00	9.50	9.50	8.25
Chicago, by-product fdry., del.	*16.30	15.288	15.10	13.75

* Plus Jan. 1 freight rate increase.

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Finished steel quoted in cents per pound and semifinished in dollars per gross ton, except as otherwise noted. Delivered prices do not include the 3 per cent federal tax on freight.

Semifinished Steel

Carbon Steel Ingots: Rerolling quality, standard analysis, $55-$60, fob mill; forging quality, $40-$60, Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown.

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, Coatesville, uncrop. $48.69.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $42-$60; Detroit, del., $44.50; Duluth (billets), $41; Pac. ports (billets), $51.50.

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $50-$54; Detroit, del., $52.50; Duluth, billets, $49; forging billets fob Pac. ports, $59.50.

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $61; del. Detroit $63.50; eastern Mich. $64.50.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $50-$60.

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb. 2.35c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, ¼ to 7/32-in., inclusive, $2.55 per 100 lb. Galveston base, $2.65 and $2.80, respectively. Worcester, add $0.10; Pacific ports, $0.535. Pittsburgh Steel Co., $2.80; Portsmouth Steel Corp., $2.55; Keystone Steel & Wire Co., $2.70.

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3-in.: Pittsburgh, Youngstown, Chicago, Gary, Cleveland, Buffalo, Birmingham base, 20 tons one size, 2.60c; Duluth, base, 2.60c; Detroit, del., 2.735c; eastern Mich., 2.785c; New York, del., 3.01c; Phila., del., 2.98c; Gulf ports, dock, 2.995c; Pac. ports, dock, 3.285c-3.56c.

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

Hot-Rolled Alloy Bars: Pittsburgh, Youngstown, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 3.05c; Detroit, del., 3.185c. (Texas Steel Co. uses Chicago base price as maximum fob Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.108	4300	$1.839
2300	1.839	4600	1.298
2500	2.759	4800	2.326
3000	0.541	5100	0.379
3100	0.920	5130 or 5152	0.494
3200	1.461	6120 or 6152	1.028
3400	3.462	6145 or 6150	1.298
4000	0.487	8612	0.703
4100 (.15-.25 Mo)	0.757	8720	0.757
(.20-.30 Mo)	0.812	9830	1.407

* Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base, 20,000-39,999 lb, 3.20c; Detroit, 3.25c; Toledo, 3.35c.

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base, 3.624c; Detroit, del., 3.759c; eastern Mich., 3.809c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base, 2.45c; Detroit, del., 2.585c; eastern Mich. and Toledo, 2.635c; Gulf ports, dock, 2.835c; Pacific ports, dock 2.885c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo, base, 2.45c; Detroit, del., 2.585c; eastern Mich. and Toledo, del., 2.635c; Gulf ports, dock, 2.835c.

Iron Bars: Single refined, Pitts., 6.15c; double refined, 7.00c; Pittsburgh, staybolt, 7.85c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base, 2.50c; Detroit, del., 2.635c; eastern Mich., del., 2.685c; Philadelphia, del., 2.70c; New York, del., 2.79c; Pacific ports, 3.085c.

(Andrews Steel Co. quotes on Middletown, O., base for shipment to Detroit area: Alan Wood Steel Co., Conshohocken, Pa., quotes 3.25c; Sparrows Point Md., base; Granite City Steel Co., 2.875c, fob Granite City, Ill., 2.775c, fob Gary or Birmingham.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown base, 3.20c; Granite City, base, 3.30c; Detroit del., 3.335c; eastern Mich., del., 3.385c; New York, del., 3.61c; Philadelphia, del., 3.58c; Pacific ports, 3.885c.

Galvanized Sheets, No. 10: Pittsburgh, Chicago, Gary, Birmingham, Youngstown, Sparrows Point, Middletown, base 3.55c; New York, del., 3.84c; Philadelphia, del., 3.75c; Pacific ports, 4.135c.

Corrugated Galvanized Sheets, No. 10: Pittsburgh, Chicago, Gary, Birmingham, base, 3.55c.

Culvert Sheets, No. 16, not corrugated, copper alloy: Pittsburgh, Chicago, Gary, Birmingham, 4.15c; Granite City, 4.25c; Pacific ports, 4.635c; copper iron 4.50c; pure iron, 4.50c.

Aluminized Sheets, No. 20 hot-dipped, coils or cut to lengths: Pittsburgh, 9.00c.

Long Ternes, No. 10: Pittsburgh, Chicago, Gary, base, 3.55c; Pacific ports, 4.335c.

Enameling Sheets, No. 12: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown base, 3.55c; Granite City, base, 3.65c; Detroit del., 3.685c; eastern Mich., 3.735c; Pacific ports, 4.235c.

Electrical Sheets, No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.90c	4.685c	4.00c
Armature	4.25c	5.035c	4.35c
Electrical	4.75c	5.535c	4.85c
Motor	5.425c	6.21c	5.525c
Dynamo	6.125c	6.91c	6.225c
Transformer			
72	6.625c	7.41c	....
65	7.625c	8.41c	....
58	8.125c	8.91c	....
52	8.925c	9.71c	....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base, 2.50c; Detroit, del., 2.635c; eastern Mich., del., 2.685c; Pacific ports, 3.185c. (Superior Steel Corp., 3.30c, Pittsburgh.)

Cold-Rolled Strip, 0.25 carbon and less: Pittsburgh, Cleveland, Youngstown, 3.20c; Chicago, base, 3.30c; Detroit, del., 3.335c; eastern Mich., 3.385c; Wooster, base, 3.40c. (Superior Steel Corp., 4.70c, Pittsburgh.)

Cold-Finished Spring Steel, 0.26-0.50 carbon: Pittsburgh, Cleveland, base, 3.03c; add 0.20c for Worcester.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb base box, $5.75; Granite City, Birmingham, Sparrows Point, $5.85.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb base box 0.25 lb tin, $4.85; 0.50 lb tin, $5.05; 0.75 lb tin, $5.25; Granite City, Birmingham, Sparrows Point, $4.95, $5.15, $5.35, respectively.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29-gage and lighter, 3.60c; Granite City, Birmingham, Sparrows Point, 3.50c; Pacific ports, boxed 4.435c.

Manufacturing Ternes (Special Coated): Pittsburgh, Chicago, Gary, 100-base box, $4.90; Granite City, Birmingham, Sparrows Point, $5.00.

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I. C. 8-lb $13.50; 15-lb $15.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.50c; Geneva, Utah, 2.65c; New York, del., 2.94c; Phila., del., 2.85c; St. Louis, del., 2.74c; Boston, del., 2.86c; Pacific ports, 3.085-3.46c; Gulf ports, 2.885c.

(Central Iron & Steel Co., Harrisburg, Pa., 3.40c, basing points; Lukens Steel Co., Coatesville, Pa., Worth Steel Co., Claymont, Del., Alan Wood Steel Co., Conshohocken, Pa., 2.80c, base.)

Floor Plates: Pittsburgh, Chicago, 3.90c; Pacific ports, 4.435c; Gulf ports, 4.135c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.787c; Gulf ports, 4.308c; Pacific ports, 4.525c.

Clad Steel Plates: Coatesville, 10% cladding: nickel clad, 18.72c; inconel-clad, 26.00c; monel-clad, 24.96c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.50c; Geneva, Utah, 2.50c; New York, del., 2.70c; Phila., del., 2.64c; Pacific ports, 3.035-3.41c; Gulf ports, 2.735c.

(Phoenix Iron Co., Phoenixville, Pa., 3.05c, Bethlehem, Pa.)

Steel Piling: Pittsburgh, Chicago, Buffalo, $3 per 100 lb; Pacific ports, $3.585.

Wire and Wire Products

(Fob Pittsburgh, Chicago, Cleveland and Birmingham per 100 pounds).

Wire to Manufacturers in carloads

Bright, basic or bessemer	*$3.30
Spring (except Birmingham)	**$4.25

Wire Products to Trade

Nails and Staples

Standard and cement-coated	†$3.75
Galvanized	‡$3.75

Wire, Merchant Quality

Annealed (6 to 8 base)	§$3.95
Galvanized (6 to 8 base)	§$4.40

(Fob Pittsburgh, Chicago, Cleveland, Birmingham, per base column)

Woven fence, 15 gage and heavier	84
Barbed wire, 80-rod spool	94
Barbless wire, twisted	94
Fence posts	84
Bale ties, single loop	86

* Add $0.10 for Worcester, $0.05 for Duluth and $0.535 for Pacific ports. Portsmouth Steel Corp., $3.425, Pittsburgh Steel Co., $3.55.

** Add $0.10 for Worcester, $0.25 for Duluth and Trenton, N. J., $0.535 for Pacific ports.

† Add $0.30 for Worcester, $0.535 for Pacific ports. Nichols Wire & Steel, $4.25; Pittsburgh Steel Co., $4.10.

‡ Add $0.535 for Pacific ports.

§ Add $0.10 for Worcester; $0.735 Pacific ports.

Tubular Goods

Pipe: Base price in carloads, threaded and coupled, to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind., 2 points less on lap weld and 1 point less on butt weld on sizes produced in that district. Pittsburgh base only on wrought iron pipe.

Butt Weld

In.	Steel Blk.	Steel Gal.	In.	Iron Blk.	Iron Gal.
⅛	48	23	½	—20	+20
¼ & ⅜	51	30½	⅝	—11½	+10
½	55½	41	1-1¼	—17	+ 2
¾	58½	45	1½	—22½	— 1½
1-3	60½	47½	2	—23	— 2

Lap Weld

In.	Steel Blk.	Steel Gal.	In.	Iron Blk.	Iron Gal.
			1¼	— 1	+20
2	53	39½	1½	— 7*	+13
2½-3	56	42½	2	—14½	+ 5½
3½-6	58	44½	2½-3½	—17	+ 1½
*7&8	58	42½	4	—21	— 4
*9&10	57½	42	4½-8	—19	— 2½
*11&12	56½	41	9-12	—10	+ 7

* Not T. & C.

Seamless Steel

In.	Blk.	Gal.	In.	Blk.	Gal.
2	52	38½	* 7 & 8	57	42½
2½-3	55	41½	* 9 & 10.	56½	42
3½-6	57	43½	*11 & 12.	55½	41

* Not T. & C.

Boiler Tubes: Net base prices per 100 feet, fob Pittsburgh, in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O.D. Sizes	B.W.G.	Seamless Hot Rolled	Seamless Cold Drawn	Elec. Weld Hot Rolled	Elec. Weld Cold Drawn
1"	13	....	$10.89	$10.30	$10.62
1¼"	13	....	12.90	10.59	12.58
1½"	13	$12.00	14.26	11.70	13.90
1¾"	13	13.65	16.23	13.31	15.82
2"	13	15.29	18.17	15.00	17.95
2¼"	13	17.05	20.26	16.71	20.00
2¼"	12	18.78	22.31	18.38	22.00
2½"	12	20.57	24.43	20.11	24.07
2¾"	12	21.80	25.89	21.27	25.46
3"	12	22.87	27.18	22.26	26.68
3¼"	11	26.88	31.94	26.15	31.33
3½"	11	28.88	34.30	28.06	33.64
4"	10	35.82	42.55	34.78	41.68
4½"	9	47.48	56.42	....	....
5"	9	54.96	65.30	....	....
6"	7	84.38	100.25	....	....

Pipe, Cast Iron: Class B, 6-in. and over, $65 per net ton, Birmingham; $70, Burlington, N. J.; *$67.80, del., Chicago; 4-in. pipe, $5 higher, Class A pipe, $3 a ton over class B.

* Plus Jan. 1 freight rate increase.

Rails, Supplies

Rails: Standard, over 60-lb, fob mill, $2.50 per 100 lb. Light rails (billet), Chicago, Birmingham, $2.85 per 100 lb; Pittsburgh, del., *$2.875; West Virginia Steel & Mfg. Co., $55 per net ton. Relaying, 35 lb and over, fob railroad and basing points, $31-$33 per net ton.

* Plus Jan. 1 freight rate increase.

Supplies: Track bolts, 6.50c; heat treated, 6.75c. Tie plates, $2.80 per 100 lb, fob mill. Splice bars, $3 per 100 lb. Standard spikes, 3.65c-4.50c; screw spikes, 5.30c-6.40c.

Bolts, Nuts

Fob Pittsburgh, Cleveland, Birmingham, Chicago, Lebanon, Pa. Additional discounts: 5 for carloads; 15 for full containers, except tire, step and plow bolts.

Carriage and Machine

½-in. and smaller; up to 6 in. in length	55 off
⅝ and ⅞, up to 6 in. in length	52 off
¾ x 6 in.	49 off
⅞ and 1 in. x 6 in. length	51 off
1⅛ in. and larger in all lengths and ⅞ in. and larger in lengths over 6 in.	48 off
⅛ in. and smaller, longer than 6 in.	45 off
Tire bolts	38⅛ off
Step bolts	46 off
Plow bolts	57 off

Stove Bolts

In packages, nuts separate, 60-10 off; bulk 74 off on 15,000 of 3-in. and shorter, or 5000 over 3-in., nuts separate.

Nuts

	A. S. Light	A. S. Regular and Heavy
Semifinished hexagon	51 off	....
⅞-in. and smaller	....	48 off
1-in. and smaller	48 off	....
1-in.-1-in.	....	47 off
1⅛-in.-1¼-in.	46 off	45 off
1⅜-in. and larger	....	44 off

Additional discount of 15 for full containers.

Hexagon Cap Screws

Upset 1-in., smaller (10-20 bright)	56 off
Upset (10-35 heat treated)	
⅝ x 6	51 off
¾, ⅞ & 1 x 6	47 off

Square Head Set Screws

Upset 1-in. and smaller	61 off
Headless, ¼-in. and larger	46 off
No. 10 and smaller	56 off

Rivets

Fob Pittsburgh, Cleveland, Chicago Birmingham, Lebanon, Pa.

Structural	5.25c
⅞-inch and under	55-5 off

Washers, Wrought

Fob Pittsburgh, Chicago, Philadelphia, to jobbers and large nut and bolt manufacturers, lcl ..... $2.75-$3.00 off

Tool Steels

Tool Steel: Pittsburgh, Bethlehem, Syracuse, Canton, O., Dunkirk, N. Y., base, cents per lb; reg. carbon 15.15c; extra carbon 19.48c; special carbon 23.80c; oil-hardening 25.97c; high carbon-chromium 46.53c.

W	Cr	V	Mo	Base, per lb
18.00	4	1	...	72.49c
1.5	4	1	8.5	58.43c
...	4	2	3	58.43c
6.40	4.15	1.90	5	62.22c
5.50	4.50	4	4.50	75.74c

Stainless Steels

Base, Cents per lb

Grade	Bars Drawn Wire Structurals	Plates	Sheets	Hot Rolled Strip	Cold Rolled Strip
301	26.00c	29.50c	37.00c	22.00c	28.00c
302	26.00	29.50	37.00	23.50	30.50
302B	26.00	29.50	37.00	23.50	30.50
303	28.50	31.50	39.00	29.50	36.00
304	27.50	31.50	39.00	25.50	32.50
308	31.50	37.00	44.50	31.00	38.00
309	39.00	43.50	51.00	40.50	51.00
310	53.50	56.50	57.50	53.00	61.00
311	53.50	56.50	57.50	53.00	61.00
316	43.50	48.00	52.00	43.50	52.00
321	31.50	37.00	44.50	32.00	41.50
325	28.50	32.50	40.50	28.50	37.00
330	53.50	56.50	57.50	53.00	61.00
347	36.00	41.50	49.00	36.00	45.50
403	23.50	27.00	32.00	23.00	29.50
405	22.00	25.00	30.50	21.50	28.00
406	25.00	28.50	34.00	25.00	34.00
410	20.50	23.50	29.00	18.50	24.00
414	20.50	23.50	29.00	18.50	24.00
416	21.00	24.00	29.50	20.00	25.50
420	26.00	31.00	36.50	26.00	39.50
430	21.00	24.00	31.50	19.00	24.50
430F	21.50	24.50	32.00	20.50	27.00
431	21.00	24.00	31.50	19.00	24.50
440A	26.00	31.00	36.50	26.00	39.50
440B	26.00	31.00	36.50	26.00	39.50
440C	26.00	31.00	36.50	26.00	39.50
442	24.50	28.00	35.50	26.00	35.00
443	24.50	28.00	35.50	26.00	35.00
446	30.00	33.00	39.50	38.00	56.50
*501	9.00	13.00	17.50	13.00	18.50
*502	10.00	14.50	18.50	14.50	19.50

* Low chromium.

Metallurgical Coke

Price Per Net Ton Beehive Ovens	
Connellsville, furnace	*$8.75
Connellsville, foundry	9.50-10.50
New River, foundry	10.25-10.50
Wise county, foundry	9.00- 9.50
Wise county, furnace	8.50- 9.00
By-Product Foundry	
Kearney, N. J., ovens	15.35
Chicago, outside delivered	15.10
Chicago, delivered	16.10
Terre Haute, delivered	14.85
Milwaukee, ovens	15.85
New England, delivered	17.25
St. Louis, delivered	†15.10
Birmingham, delivered	12.25
Indianapolis, delivered	14.85
Cincinnati, delivered	14.60
Cleveland, delivered	14.50
Buffalo, delivered	14.75
Detroit, delivered	15.10
Philadelphia, ovens	14.50

* Operators of hand-drawn ovens using trucked coal, $9.35.

† 15.68 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal, freight allowed east of Omaha.

Pure and 90% benzol	15.00c
Toluol, two degree	22.00c
Industrial xylol	22.00c
Solvent naphtha	26.00c

WAREHOUSE STEEL PRICES

Base delivered prices, cents per pound, for delivery within switching limits, subject to established extras. Quotations based on mill prices announced March 1, 1946

	Hot-rolled bars†	Structural shapes†	Plates†	Floor plates†	Hot-rolled sheets† (10-gage base)	Hot-rolled strip† (14-gage and lighter, 6-in. and narrower)	Hot-rolled strip† (12-gage and heavier, wider than 6-inch)	Galvanized flat sheets (24-gage base)†	Cold-rolled sheets† (17-gage base)	Cold finished bars†	Cold-rolled strip†
Boston	4.356[1]	4.203[1]	4.203[1]	6.039[1]	4.050[2]	5.548[1]	4.418[1]	5.725[13]	5.031[14]	4.656[24]	4.965
New York	4.134[1]	4.038[1]	4.049[1]	5.875[1]	3.856[1]	4.375[1]	4.275[1]	5.501[13]	4.838[14]	4.584[24]	5.075
Jersey City	4.155[1]	4.018[1]	4.049[1]	5.875[1]	3.856[1]	4.375[1]	4.275[1]	5.501[13]	4.890[14]	4.605[24]	5.075
Philadelphia	4.114[1]	3.937[1]	3.875[1]	5.564[1]	3.774[1]	4.664[1]	4.554[1]	5.499[13]	5.139[25]	4.564[24]	5.064
Baltimore	4.093[1]	4.05[1]	3.865[1]	5.543[1]	3.64[1]	4.293[1]	4.193[1]	5.365[17]	5.118[25]	4.543[24]	....
Washington	4.232[1]	4.22[1]	4.067[1]	5.632[1]	3.842[1]	4.432[1]	4.332[1]	5.667[17]	5.007[24]	4.532[24]	....
Norfolk, Va.	4.377[1]	4.308[1]	4.262[1]	5.777[1]	4.037[1]	4.927[1]	4.477[1]	5.862[17]	4.552[24]	4.677[24]	....
Bethlehem, Pa.*	....	3.70[1]	....	....	....	....	....	....	....	....	....
Claymont, Del.*	....	....	3.70[1]	....	....	....	....	....	....	....	....
Coatesville, Pa.*	....	....	3.70[1]	....	....	....	....	....	....	....	....
Buffalo (city)	3.60[1]	3.65[1]	3.92[1]	5.55[1]	3.575[1]	4.21[1]	4.11[1]	5.20[15]	4.625[16]	4.20[24]	4.96
Buffalo (country)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.475[1]	3.85[1]	3.750[1]	5.10[15]	4.525[16]	4.10[24]	4.60
Pittsburgh (city)	3.60[1]	3.65[1]	3.65[1]	5.25[1]	3.575[1]	3.95[1]	3.850[1]	5.327[15]	4.625[24]	4.20[24]	4.70
Pittsburgh (country)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.475[1]	3.85[1]	3.750[1]	5.10[15]	4.525[24]	4.10[24]	4.60
Cleveland (city)	3.60[1]	3.88[1]	3.65[1]	5.48[1]	3.575[1]	3.95[1]	3.850[1]	5.347[15]	4.625[24]	4.20[24]	4.70
Cleveland (country)	3.50[1]	....	3.55[1]	....	3.475[1]	3.85[1]	3.750[1]	....	4.525[24]	4.10[24]	4.00
Detroit	3.735[1]	3.987[1]	3.935[1]	5.607[1]	3.710[1]	4.085[1]	3.985[1]	5.526[15]	4.760[24]	4.25[12]	4.985
Omaha (city, del.)	4.32[1]	4.37[1]	4.37[1]	5.97[1]	4.045[1]	4.53[1]	4.42[1]	6.00[15]	5.72[24]	4.945[24]	....
Omaha (country)	4.22[1]	4.27[1]	4.27[1]	5.87[1]	3.945[1]	4.42[1]	4.32[1]	5.90[15]	....	....	....
Cincinnati	3.302[1]	3.983[1]	3.952[1]	5.583[1]	3.671[1]	4.046[1]	3.946[1]	5.296[15]	4.271[24]	4.602[24]	....
Youngstown*	....	....	....	....	....	....	....	4.85[13]	....	....	....
Middletown, O.*	....	....	....	....	3.475[1]	3.85[1]	3.750[1]	5.10[15]	....	....	....
Chicago (city)	3.75[1]	3.80[1]	3.80[1]	5.40[1]	3.475[1]	3.95[1]	3.850[1]	5.40[15]	4.425[24]	4.20[24]	4.90
Milwaukee	3.908[1]	3.958[1]	3.958[1]	5.558[1]	3.633[1]	4.108[1]	4.008[1]	5.558[15]	4.583[24]	4.358[24]	5.058
Indianapolis	3.83[1]	3.88[1]	3.88[1]	5.48[1]	3.743[1]	4.118[1]	4.018[1]	5.368[15]	4.793[24]	4.43[24]	5.060
St. Paul	4.092[3]	4.142[3]	4.142[3]	5.742[3]	3.817[3]	4.292[3]	4.192[3]	5.666[15]	4.767[24]	4.852[24]	5.398
St. Louis	3.918[1]	3.968[1]	3.968[1]	5.568[1]	3.643[1]	4.118[1]	4.018[1]	5.622[15]	4.593[24]	4.522[24]	5.232
Memphis, Tenn.	4.296[1]	4.346[1]	4.346[1]	6.071[1]	4.221[1]	4.596[1]	4.496[1]	5.746[15]	....	4.821[24]	....
Birmingham	3.75[1]	3.80[1]	3.80[1]	6.158[1]	3.675[1]	4.05[1]	4.05[1]	5.20[15]	5.077[24]	4.99[24]	5.485
New Orleans (city)	4.358[1]	4.408[1]	4.408[1]	6.329[1]	4.283[1]	4.658[1]	....	5.808[15]	5.304[24]	5.079[24]	....
Houston, Tex.	4.00[3]	4.50[1]	4.50[1]	5.75[3]	3.988[3]	4.668[3]	4.568[3]	5.763[24]	5.819[25]	4.10[24]	....
Los Angeles	4.65[4]	4.70[4]	5.80[4]	7.05[4]	4.95[4]	5.30[4]	5.200[4]	6.55[13]	6.60[6]	6.105[24]	5.868
San Francisco	4.235[7]	4.185[7]	4.185[7]	5.885[7]	4.16[7]	5.885[1]	4.535[1]	6.385[15]	6.91[15]	5.783[24]	7.586
Portland, Oreg.	4.70[27]	4.70[27]	5.00[27]	6.75[27]	4.875[27]	6.65[27]	5.000[27]	6.20[15]	6.825[15]	5.983[15]	....
Tacoma, Wash.	4.60[6]	4.70[6]	5.00[6]	6.75[6]	4.87[6]	5.80[6]	4.60[6]	6.40[15]	6.55[15]	6.23[24]	....
Seattle	4.60[6]	4.70[6]	5.00[6]	6.75[6]	4.87[6]	5.80[6]	4.60[6]	6.40[15]	6.55[15]	6.28[24]	....

* Basing point cities with quotations representing mill prices, plus warehouse spread.

† Prices nominal pending establishment of new quotations to reflect mill increases and higher freight rates.

BASE QUANTITIES

[1]—400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—800 to 1999 pounds; [5]—400 to 8999 pounds; [6]—300 to 9999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundles; [18]—one to six bundles; [19]—100 to 749 pounds; [24]—300 to 1999 pounds; [25]—1500 to 39,999 pounds; [26]—1500 to 1999 pounds; [28]—1000 to 39,999 pounds; [34]—400 to 1499 pounds; [36]—1000 to 1999 pounds; [38]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, base; [27]—300 to 4999 pounds.

ORES

Lake Superior Iron Ore
Gross ton, 51½% (Natural)
Lower Lake Ports

Old range bessemer	$5.45
Old range nonbessemer	5.30
Mesabi bessemer	5.20
Mesabi nonbessemer	5.05
High phosphorus	5.05

Eastern Local Ore

Cents, units, del. E. Pa.

Foundry and basic 56-63% contract	13.00

Foreign Ore

Cents per unit, cif Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mn.	Nom.
N. African low phos.	Nom.
Swedish basic, 60 to 68%	13.00
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% fob Rio de Janeiro	7.50–8.00

Tungsten Ore

Chinese Wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

Gross ton fob cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Oreg., or Tacoma, Wash.
(S S paying for discharge; dry basis, subject to penalties if guarantees are not met.)

Indian and African

48% 2.8:1	$39.75
48% 3:1	41.00
48% no ratio	31.00

South African (Transvaal)

44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80

Brazilian—nominal

44% 2.5:1 lump	$33.65
48% 3:1 lump	48.50

Rhodesian

45% no ratio	$28.30
48% no ratio	31.00
48% 3:1 lump	41.00

Domestic (seller's nearest rail)

48% 3:1	$43.50
less $7 freight allowance.	

Manganese Ore

Sales prices of Office of Metals Reserve, cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91c; prices include duty on imported ore and are subject to established premiums, penalties and other provisions. Price at basing points which are also points of discharge of imported manganese ore is fob cars, shipside, at dock most favorable to the buyer. Outside shipments direct to consumers at 15c to 17c per unit less than Metal Reserve prices.

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Designation	Carbon	Mn	Si	Cr	Ni	Mo	Basic open-hearth Electric furnaces: Bars per 100 lb	Billets per GT	Bars per 100 lb	Billets per GT
	Chemical Composition Limits, Per Cent									
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	$0.812	$16.230	$1.353	$27.050
NE 9425	.23-.28	.80-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.812	16.230	1.353	27.050
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.866	17.312	1.407	28.132
NE 9722	.20-.25	.50-.80	.20-.35	.10-.25	.40-.70	.15-.25	.703	14.066	1.244	24.886
NE 9912	.10-.15	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.298	25.968	1.677	33.542
NE 9920	.18-.23	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.298	25.968	1.677	33.542

Extras are in addition to a base price of 2.921c per pound on finished products and $58.48 per gross ton on semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices quoted on vanadium alloy.

PIG IRON

Maximum prices per gross ton. Minimum delivered prices do not include 3 per cent federal tax.

	No. 2 Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$31.50	$31.00	$32.50	$32.00
Newark, N. J., del.	33.34	32.84	34.34	35.54
Brooklyn, N. Y., del.	34.50	....	....	35.00
Birdsboro, Pa., base	31.50	31.00	32.50	32.00
Birmingham, base	26.88	25.50	31.50	....
Baltimore, del.	*32.22	....	....	....
Boston, del.	*31.62	....	....	....
Chicago, del.	*30.72	....	....	....
Cincinnati, del.	*30.94	*30.06	....	....
Cleveland, del.	*30.62	*29.74	....	....
Newark, N. J., del.	32.96	....	....	....
Philadelphia, del.	32.13	31.63	....	....
St. Louis, del.	*30.62	*31.54	....	....
Buffalo, base	30.50	30.00	31.50	31.00
Boston, del.	36.98	36.48	37.98	37.48
Rochester, del.	*32.03	....	*33.03	*32.53
Syracuse, del.	*32.58	....	*33.58	*33.08
Chicago, base	30.50	30.00	31.00	30.50
Milwaukee, del.	31.82	31.32	32.32	31.82
Muskegon, Mich., del.	34.33	....	....	34.33
Cleveland, base	30.50	30.00	31.00	30.50
Akron, Canton, del.	32.17	31.67	32.67	32.17
Detroit, base	30.50	30.00	31.00	30.50
Saginaw, Mich., del.	33.67	33.17	34.17	33.67
Duluth, base	31.00	30.50	31.50	31.00
St. Paul, del.	*33.13	*32.63	*33.63	*33.13
Erie, Pa., base	30.50	30.00	31.50	31.00
Everett, Mass., base	29.50	29.00	30.50	30.00
Boston, del.	30.00	29.50	31.00	30.50
Granite City, Ill., base	30.50	30.00	31.00	30.50
St. Louis, del.	*31.00	*30.50	....	*31.00
Neville Island, Pa., base	30.50	30.00	31.00	30.50
†Pittsburgh, del., N.&S. sides.	31.33	30.83	31.83	31.33
Provo, Utah, base	28.50	28.00	....	....
Sharpsville, Pa., base	30.50	30.00	31.00	30.50
Steelton, Pa., base	31.50	31.00	32.50	32.00
Swedeland, Pa., base	31.50	31.00	32.50	32.00
Philadelphia, del.	32.51	32.01	....	33.01
Toledo, O., base	30.50	30.00	31.00	30.50
Cincinnati, del.	*33.78	*33.26	*34.26	*33.78
Youngstown, O., base	30.50	30.00	31.00	30.50
Mansfield, O., del.	33.48	32.98	33.98	33.48

*Plus Jan 1 freight rate increase.

† To Neville Island base add: 66c for McKees Rocks, Pa.; $1.01 Lawrenceville, Homestead, McKeesport, Ambridge, Monaco, Aliquippa; 97c (water), Monongahela; $1.33, Oakmont, Verona; $1.49 Brackenridge.

Exceptions to above prices: Kaiser-Frazer Parts Corp., Struthers, O., charges 50 cents a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable pig iron.

High Silicon Silvery

6.00-6.50 per cent (base)	$36.00		
6.51-7.00	$37.00	9.01- 9.50	42.00
7.01-7.50	38.00	9.51-10.00	43.00
7.51-8.00	39.00	10.01-10.50	44.00
8.01-8.50	40.00	10.51-11.00	45.00
8.51-9.00	41.00	11.01-11.50	46.00

Fob Jackson, O., per gross ton. Buffalo base $1.25 higher. Buyer may use whichever base is more favorable.

Electric Furnace Ferrosilicon: Si 14.01-14.50%, $52.75, Jackson, O.; $56 Keokuk, Iowa; $54, Buffalo and Niagara Falls, N. Y. Add $1 a ton for each additional 0.5% Si to 18%; 50c for each 0.5% Mn over 1%; $1 a ton for 0.045% max. phos.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton.

Charcoal Pig Iron

Semi-cold blast, low phosphorus. Fob furnace, Lyles, Tenn. $37.50 (For higher silicon irons a differential over and above the price of base grade is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Gray Forge

Neville Island, Pa. $30.00

Low Phosphorus

Steelton, Pa., Buffalo, Troy, N. Y., Birdsboro, Pa., $36, base; Philadelphia, $37.49, del. Intermediate phosphorus, Central furnace, Cleveland, $33.

Differentials

Basing point prices are subject to following differentials:

Silicon: An additional charge not to exceed 50 cents a ton for each 0.25 per cent silicon in excess of base grade (1.75% to 2.25%).

Phosphorus: A reduction of 38 cents a ton for phosphorus content of 0.70 per cent and over.

Manganese: An additional charge not to exceed 50 cents a ton for each 0.50 per cent, or portion thereof, manganese in excess of 1%.

Nickel: An additional charge for nickel content as follows: Under 0.50%, no extra; 0.50% to 0.74%, inclusive, $2 a ton; for each additional 0.25% nickel, $1 a ton.

Refractories

Per 1000, fob shipping point Net Prices

Fire Clay Brick

Super Duty

Pa., Mo., Ky.	$81.00

High Heat Duty

Pa., Ill., Md., Mo., Ky.	65.00
Ala., Ga.	65.00
N. J.	70.00

Intermediate Heat Duty

Ohio	57.00
Pa., Ill., Md., Mo., Ky.	59.00
Ala., Ga.	51.00
N. J.	62.00

Low Heat Duty

Pa., Md., Ohio	51.00

Malleable Bung Brick

All bases	75.00

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry Press	42.00
Wire Cut	40.00

Silica Brick

Pennsylvania	65.00
Joliet, E. Chicago	74.00
Birmingham, Ala.	65.00

Magnesite

Domestic dead-burned grains, net ton, fob Chewelah, Wash.

Bulk	22.00
Bags	26.00

Basic Brick

Net ton, fob Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Metallurgical grade, fob shipping point in Ill., Ky., net tons, carloads, effective CaF_2 content, 70% or more, $33; 65% to 70%, $32; 60% to 65%, $31; less than 60%, $30.

Open Market Prices of Leading Ferroalloy Products

Spiegeleisen: 19-21% carlot per gross ton, Palmerton, Pa., $40; Pittsburgh, $40.50; Chicago, $40.60.

Ferromanganese, standard: 78-82% c.l. gross ton, duty paid, $135 fob cars, Baltimore, Philadelphia or New York, whichever is most favorable to buyer, Rockdale or Rockwood, Tenn. (where Tennessee Products Co. is producer), Birmingham, Ala. (where Sloss-Sheffield Steel & Iron Co. is producer); $140 fob cars, Pittsburgh (where Carnegie-Illinois Steel Corp. is producer); add $8 for packed c.l., $10 for ton, $13.50 for less ton; $1.70 for each 1%, or fraction contained manganese over 82% or under 78%.

Ferromanganese, low carbon: Eastern zone: Special, 21c; regular, 20.50c; medium, 14.50c; central zone: special, 21.30c; regular, 20.80c; medium, 14.80c; western zone: Special, 21.70c; regular, 21.20c; medium, 15.20c. Prices are per pound contained Mn, bulk carlot shipments, fob shipping point, freight allowed. Special low-carbon has content of 90% Mn, 0.10% C, and 0.06% P.

Ferromanganese Briquets: (Weight approx. 3 lb and containing exactly 2 lb Mn) Prices per lb of briquets: Contract, carlots, bulk 6.40c, packed 6.90c, tons 7.30c, less 7.70c, eastern, freight allowed; 6.65c, 7.15c, 7.90c and 8.30c, central; 7.20c, 7.70c, 9.80c and 10.20c, western; spot up 0.25c; notched up 0.25c.

Ferrotungsten: Spot, 10,000 lb or more, per lb contained W, $1.90; contract, $1.88; freight allowed as far west as St. Louis.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb contained Ti; ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5c per lb.

Ferrotitanium: 20-25%, 0.10 maximum C; per lb contained Ti; ton lots $1.35; less-ton lots $1.40 eastern. Spot up 5c per lb.

Ferrotitanium, High-Carbon: 15-20% contract basis, per net ton, fob Niagara Falls, N. Y., freight allowed to destination east of Mississippi river and north of Baltimore and St. Louis, 6.8% C $142.50; 3-5% C $157.50.

Ferrovanadium: V 35-55%, contract basis, per lb contained V, fob producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Ferromolybdenum: 55-75% per lb, contained Mo, fob Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% P content with unitage of $3 for each 1% of P above or below the base; gross tons per carload fob sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Contract, lump, packed; eastern zone quotations: 90-95% c.l. 12.95c, ton lots 13.45c, smaller lots 13.95c; 80-90%, c.l. 11.35c, ton lots 11.90c, smaller lots 12.45c; 75%, c.l. 10.15c, ton lots 10.75c, smaller lots 11.35c; 50% c.l. 8.45c, ton lots 9.10c, smaller lots 9.75c. Deduct 1.0c for bulk carlots 75%, 80-90%, 90-95%. Prices are fob shipping point, freight allowed, per lb of contained Si. Spot prices 0.25c higher on 80-90%, 0.30c on 75%, 0.45c on 50%.

Ferroboron: (B 17.50% max. and C 1.50% max., Al 0.50% max. and C 0.50% max.) Prices per lb of alloy, contract, ton lots $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Ferrocolumbium: 50-60%, per lb contained columbium in gross ton lots, contract basis, R. R. freight allowed, eastern zone, $2.50; less ton lots $2.55. Spot up 10c.

Ferrochrome: Contract, lump, packed; **high carbon,** eastern zone, c.l. 16.20c, ton lots 16.80c; central zone, add 0.40c and 1.30c; western zone, add 0.55c and 2.10c. Deduct 0.60c for bulk carlots.

High carbon, high nitrogen, add 5c to all high carbon ferrochrome prices. Deduct 0.55c for bulk carlots. Spot prices up 0.25c.

Low carbon, eastern zone, bulk, c.l., max. 0.06% C 23c; 0.1% 22.50c, 0.15% 22c, 0.2% 21.50c, 0.5% 21c, 1% 20.50c, 2% 19.50c; add 1c for 2000 lb to c.l.; central zone, add 0.4c for bulk, c.l., and 0.65c for 2000 lb to c.l.; western zone, add 0.5c for bulk, c.l., and 1.85c for 2000 lb to c.l.; carload packed differential 0.45c. Prices are per pound of contained Cr, fob shipping points.

Low carbon, high nitrogen: Add 2c to low carbon ferrochrome prices. For higher nitrogen low carbon, add 2c for each 0.25% of nitrogen over 0.75%.

Ferrochrome, Special Foundry: (Cr 62-66%, C above 5-7%.) Contract, 2-inch x D, packed, eastern zone, freight allowed, c.l. 17.05c, ton lots 17.60c, less than ton 18.30c; central zone, add 0.40c for c.l. and 1.30c for smaller lots; western zone, add 0.55c for c.l. and 2.10c for smaller lots. Deduct 0.60c for bulk carlots.

S. M. Ferrochrome, high carbon: (Cr 60-65%, Si, Mn and C 4-6% each.) Contract, lump, packed, eastern zone, freight allowed, c.l. 17.30c, ton lots 17.90c, less than ton 18.60c; central zone, add 0.40c for c.l. and 1.30c for smaller lots; western zone, add 0.55c for c.l. and 2.10c for smaller lots. Prices are per pound of contained chromium, spot prices 0.25c higher. Deduct 0.60c for bulk carlots.

S. M. Ferrochrome, low carbon: (Cr 62-66%, Si 4-6%, Mn 4-6% and C 1.25% max.) Contract, carlot, bulk 20.00c, packed 20.15c; ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained Cr; 20.40c, 20.50c, 20.95c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up 0.25c.

Ferrochrome Briquets: Containing exactly 2 lb Cr, packed eastern zone, c.l. 10.35c, ton lots 10.75c, less than ton 11.15c; central zone, add 0.25c for c.l. and 0.90c for smaller lots; western zone, add 0.55c for c.l. and 2.10c for smaller lots. Deduct 0.50c for bulk carlots. Prices per pound of briquets; spot prices 0.25c higher; notched, 0.25c higher.

Chromium Metal: 97% min. Cr, max. 0.50% C, eastern zone, per lb contained Cr bulk, c.l. 79.50c, 2000 lb to c.l. 80c; central 81c and 82.60c; western 82.25c and 84.75c, fob shipping point, freight allowed.

Chromium-Copper: (Cr 8-11%, Cu 88-90%, Fe 1% max., Si 0.50% max.) Contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate to which equivalent of St. Louis rate will be allowed; spot up 2c.

Calcium metal; cast: Contract, ton lot or more, $1.60; 100 to 1999 lb, $1.95; less than 100 lb, $3.15 per lb of metal, eastern zone; $1.615, $1.965 and $3.185, western; spot up 5c.

Calcium-Manganese-Silicon: (Ca 16-20%, Mn 14-18% and Si 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c, and 17.85c, central;

18.05c, 19.10c and 19.60c western; spot up 0.25c.

Calcium - Silicon: (Ca 30-35%, Si 60-65% and Fe 3.00% max.), per lb of alloy. Contract, carlot, lump 13.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up 0.25c.

Silicon Metal: Min. 97% Si and max. 1% Fe, eastern zone, bulk, c.l. 13.65c; 2000 lb to c.l., 15.05c; central zone, 14.25c and 17.30c; western; 14.85c and 19.05c; min. 96% Si and max. 2% Fe, eastern, bulk, c.l. 13.15c, 2000 lb to c.l. 14.65c; central, 13.85c and 16.90c; western, 14.45c and 18.65c, fob shipping point, freight allowed. Price per lb contained Si.

Silicomanganese, containing exactly 2 lb Mn and about ½ lb Si eastern zone, bulk, c.l. 6.15c, ton lots 7.05c; central zone, add 0.25c for c.l. and 0.60c for ton lots; western, add 0.80c for c.l. and 2.50c for ton lots. Notched, up 0.25c.

Ferrosilicon: Weighing about 5 lb and containing exactly 2 lb Si, packed, eastern zone, c.l. 4.20c, ton lots 4.60c, less than ton lots 5c; weighing about 2½ lb and containing 1 lb Si, packed, eastern zone, c.l. 4.35c, ton lots 4.75c, less 5.15c; notched 0.25c higher; central zone, add 0.25c for c.l. and 0.60c for smaller lots; western zone, add 0.45c for c.l. and 0.90c for smaller lots. Prices are fob shipping point, freight allowed; spot prices 0.25c higher. Deduct 0.50c for bulk carlots.

Manganese Metal: (Min. 96% Mn, max. 2% Fe), per lb of metal, eastern zone, bulk, c.l. 30c, 2000 lb to c.l., 32.00c; central 31.00c and 33.45c; western, 31.45c and 34.40c.

Electrolytic Manganese: 99.9% plus, fob Knoxville, Tenn., freight allowed east of Mississippi on 250 lb or more: Carlots 32c, ton lots 34c, drum lots 36c, less than drum lot 38c. Add 1½c for hydrogen-removed metal.

Manganese-Boron: (Mn 75% approx., B 15-20%, Fe 5% max., Si 1.50% max. and C 3% max.) Prices per lb of alloy. Contract, ton lots $1.89, less $2.01, eastern, freight allowed; $1.903 and $2.023, central; $1.935 and $2.055, western; spot up 5c.

Nickel-Boron: (B 15-18%, Al 1% max., Si 1.50% max., C 0.50% max., Fe 3% max., Ni, balance). Prices per lb of alloy. Contract, 5 tons or more $1.90, 1 ton to 8 tons $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Borosil: 3 to 4% B, 40 to 45% Si; $6.25 per lb contained B, fob Philo, O., freight not exceeding St. Louis rate allowed.

Bortam: B 1.5-1.9%, ton lots, 45c per lb; less-ton lots, 50c per lb.

Carbortam: B 0.90 to 1.15% net ton to carload, 8c per lb, fob Suspension Bridge, N. Y., freight allowed same as high-carbon ferrotitanium.

Silicaz Alloy: (Si 35-40%, Ca 9-11%, Al 5-7%, Zr 5-7%, Ti 9-11% and B 0.55-0.75%) Prices per lb of alloy, contract, or spot carlots 35.00c, ton lots 37.00c, less 39.00c, eastern, freight allowed; 35.30c, 38.10c and 40.10c, central; 35.30c, 40.05c and 42.05c, western; spot up 0.25c.

SMZ Alloy: (Si 60-65%, Mn 5-7%, Zr 5-7% and Fe approx. 20%) Prices per lb of alloy, contract, carlots 12.50c, ton lots 13.25c, less 14.00c, eastern zone, freight allowed; 12.80c, 14.35c and 15.10c, central; 12.80c, 16.30c and 17.05c, western; spot up 0.25c.

CMSZ Alloy 4: (Cr 45-49%, Mn 4-6%, Si 18-21%, Zr 1.25-1.75% and C 3.00-4.50%). Contract or spot, carlots, bulk 12.00c, packed 12.75c; ton lots 13.50c, less 14.25c, eastern zone, freight allowed; 12.30c, 13.05c, 14.60c, 15.35c, central; 12.30c, 13.05c, 16.65c, 17.30c, western.

CMSZ Alloy 5: (Cr 50-56%, Mn 4-6%, Si 13.50-16.00%, Zr 0.75-1.25%, C 3.50-5.00%) Prices per lb of alloy, contract or spot, carlots, bulk 11.75c, packed 12.50c, ton lots 13.25c, less 14.00c, eastern, freight allowed; 12.05c, 12.80c, 16.30c, 17.05c, western.

Zirconium Alloy: 12-15%, per lb of alloy, eastern, contract, carlots, bulk 4.85c, packed 5.30c, ton lots 5.65c, less 6.00c; spot up 0.25c.

Zirconium Alloy: Zr 35-40%, eastern, contract basis, carloads in bulk or package, per lb of alloy 14.50c, ton lots 15.75c, less 17.00c; spot up 0.25c.

Alsifer: (Approx. 20% Al, 40% Si, 40% Fe) Contract basis fob Niagara Falls, N. Y., lump per lb 6.25c; ton lots 6.75c; less 7.25c. Spot up ½c.

Simanal: (Approx. 20% each Si, Mn, Al) Packed, lump, carload 9c, ton lots 9.25c, less-ton lots 9.75c per lb alloy; freight not exceeding St. Louis rate allowed.

Tungsten Metal Powder: Spot, not less than 97%, $2.50-$2.60; freight allowed as far west as St. Louis.

Grainal: Vanadium Grainal No. 1 87.5c; No. 6, 60c; No. 79, 45c; all fob Bridgeville, Pa., usual freight allowance.

Vanadium Pentoxide, technical grade: Fused, approx. 89-92% V_2O_5 and 5.84% NA_2O; or air dried, 83-85% V_2O_5 and 5.15% NA_2O, $1.10 per lb contained V_2O_5 fob plant freight allowed on quantities of 25 lb and over to St. Louis.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Prices are dollars per gross ton, including broker's commission, delivered at consumer's plant except where noted.

OPEN HEARTH AND BLAST FURNACE GRADES

	—Heavy Melting—		No. 1	—Bundles—			Machine Shop	Mixed Borings,	Short Shovel	Cast Iron
	No. 1	No. 2	Busheling	No. 1	No. 2	No. 3	Turnings	Turnings	Turnings	Borings
Pittsburgh	32.50	32.50	32.50	32.50	32.50	32.50	26.00–26.50	26.00–26.50	28.00–28.50	27.00–27.50
Philadelphia	30.50–31.50	30.50–31.50	30.50–31.50	30.50–31.50	30.50–31.50	28.50–29.00	23.50–24.00	23.50–24.00	23.50–24.00	23.50–24.00
Chicago	30.00	30.00	30.00	30.00	30.00	28.00	25.00	25.00	28.25	26.00
Cleveland	32.50	32.50	32.50	32.50	32.50	30.50	27.00	27.00	27.00	27.00
Cincinnati	29.00	29.00	28.00	29.00	29.00	....	22.50	21.00	24.00	22.50
*Boston	25.00–26.00	25.00–26.00	25.00–26.00	25.00–26.00	25.00–26.00	23.00–24.00	17.50–18.50	17.35–17.85	20.00–21.00	17.35
†New York	26.00–26.50	26.00–26.50	26.00–26.50	26.00–26.50	26.00–26.50	24.00–25.50	20.50	20.50	22.50	....
Buffalo	29.00	29.00	29.00	29.00	29.00	27.00	19.50	19.50	22.00	20.50
†Detroit	27.50–28.00	....	27.50–28.00	27.50–28.00	27.50–28.00	25.50–26.00	20.50–21.00	20.50–21.00	22.50–23.00	22.50–23.00
Valley	32.50	32.50	....	32.50	....	....	25.00	....	26.00	25.00
Mansfield	....	....	....	....	....	....	§24.00	....	....	....
St. Louis	22.22	22.22	....	....	....	....	14.72	....	16.72	....
Birmingham	22.00–22.50	22.00–22.50	22.00–22.50	22.00–22.50	22.00–22.50	20.00–20.50	14.50–15.00	14.50–15.00	16.50–17.00	15.50–16.00
San Francisco	19.50	19.50	19.50	19.50	19.50	10.00	8.00	....	....	....
Seattle	19.00	19.00	....	19.00	....	....	9.50	9.50	....	....
Los Angeles	16.50	15.50	....	14.50	14.50	....	8.00	8.00	....	....

ELECTRIC FURNACE, FOUNDRY AND SPECIAL GRADES

	Bar Crops and Plate	Cast Steel	Punchings and Plate Scrap	Electric Furnace Bundles	Heavy Turnings	Alloy Free Turnings	Cut Structural and Plate Scrap 1 ft and under	Cut Structural and Plate Scrap 2 ft and under	No. 1 Chemical Borings	Tin Can Bundles
Pittsburgh	34.50–35.00	34.50–35.00	34.50–35.00	33.00–33.50	31.00–31.50	29.00–29.50	34.50–35.00	34.50–35.00	31.50–32.00	28.00–28.50
Philadelphia	35.00–36.00	35.00–36.00	35.00–36.00	34.00–35.00	32.50–33.00	....	35.00–36.00	35.00–36.00	31.00–31.50	....
Chicago	26.25	26.25	26.25	24.75	23.25	....	26.25	25.75	....	....
Cleveland	35.00	35.00	35.00	35.00	32.50	27.00	34.50	34.50	27.00	24.50
*Boston	29.35	29.35–29.85	29.35–29.85	29.35	26.35	25.35	28.85	28.85	25.85	....
†New York	....	....	28.50–30.00	27.50–28.00	....	....	29.00–30.00	29.00–30.00	26.00	....
Buffalo	....	27.00	30.00–31.00	28.50	22.50	23.00	28.50	28.50	22.75	....
†Detroit	....	....	28.50–30.50	30.50	....	....	....	....	....	....
Birmingham	24.50–25.00	24.50–25.00	24.50–25.00	....	....	....	24.50–25.00	24.50–25.00	....	....
San Francisco	18.00	18.00	....	....	....	8.00	20.50	20.00	....	17.00

STEEL GRADES OF RAILROAD ORIGIN

	No. 1 Heavy Melting R.R. Steel	Railroad Malleable	Axles	Rails — Rerolling	Rails — Random Lengths	Rails — Cut 3-ft and under	Rails — Cut 18-in. and under	Railroad Specialties	Uncut Tires	Angles, Splice Bars
Pittsburgh	33.50	34.00	38.50	35.00	33.00	35.00	36.00	36.00–36.50	36.00	36.00
Chicago	30.00	....	....	34.50–35.00	33.00	32.00	33.25	33.50	....	32.00
Cincinnati	29.00	35.00	....	36.00	36.00	....	40.00	....	....	....
Valley	32.50	....	....	....	....	....	....	....	....	....
St. Louis	....	28.00	27.00	25.00	24.00	27.50	....	....	23.50	23.50
Birmingham	23.00–23.50	....	....	25.50–26.00	24.00–24.50	26.50–27.00	27.50–28.00	....	....	25.50–26.00
San Francisco	....	....	26.50	....	21.00	....	....	....	23.00	....
Seattle	17.00	17.00	....	....	....	....	....	....	....	....

CAST IRON GRADES

	No. 1 Cupola Cast	Charging Box Cast	Heavy Breakable Cast	Stove Plate	Unstripped Motor Blocks	Malleable	Brake Shoes	Clean Auto Cast	No. 1 Wheels	Burnt Cast
Pittsburgh	43.00–44.00	43.00–44.00	41.00–42.00	39.00–40.00	36.00–38.00	40.00–41.00	33.00–34.00	43.00–44.00	38.00–39.00	33.00–34.00
Philadelphia	41.00–42.00	40.00	40.00	....	37.50–38.00	40.00	....	41.00–42.00	41.00	38.00
Chicago	35.00–45.00	....	....	....	....	35.00–45.00	....	35.00–45.00	....	....
Cincinnati	40.00	30.00	32.00	28.00	30.00	....	28.00	40.00	....	....
*Boston	38.00–40.00	36.00–38.00	35.00–37.00	36.00	....	....	....	38.00–40.00	....	....
†New York	37.00–38.00	37.00–38.00	....	....	34.50	32.00	....	....	....	....
Buffalo	35.00–40.00	31.00–35.00	....	33.00–38.00	....	34.00–38.00	....	38.00	32.75–33.25	....
†Detroit	35.00–37.00	....	28.00–30.00	....	....	....	....	35.00–37.00	....	....
*St. Louis	25.00–30.00	25.22	22.75	27.00	....	....	20.25	32.00	26.00	20.25
Birmingham	30.00	....	25.00	28.00	25.00	....	22.75	....	27.00	....
Seattle	**27.50	....	....	23.00	....	....	....	....	24.50	....
Los Angeles	30.00	....	....	....	....	....	....	....	....	....

* For shipping point; † fob tracks; ‡ dealers buying prices; § nominal; ** fob dealers yard.

NONFERROUS METAL PRICES

Copper: Electrolytic, carlots 19.50c, del. Conn.; Lake, 19.62½c, del. Conn. Dealers may add ¾c for 5000 lb to carload; 1c, 1000-4999 lb; 1½c, 500-999 lb; 2c, 0-499 lb. Casting, 19.25c, refinery, 20,000 lb or more; 19.50c, less than 20,000 lb.

Brass Ingot: 85-5-5-5 (No. 115) 20.50c; 88-10-2 (No. 215) 24.75c; 80-10-10 (No. 305) 23.50c; No. 1 yellow (No. 405) 16.25c; carlot prices, including 25c per 100 lb freight allowance; add ¼c for less than 20 tons.

Zinc: Price western 10.50c, brass special 10.75c, intermediate 11.00c, E. St. Louis; high grade 11.50c, del., carlots. For 20,000 lb to carlots add 0.15c; 10,000-20,000 lb 0.25c; 2000-10,000 lb 0.4c; under 2000 lb 0.50c.

Lead: Common 12.80c, chemical 12.90c, corroding 12.90c, E. St. Louis for carlots; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland - Akron - Detroit area, New Jersey, New York state, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston - Worcester, Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lb and over; add ½c 5000-9999 lb; 1c less through 2000 lb.

Secondary Aluminum: Piston alloy (No. 122 type) 17.00c; No. 12 foundry alloy (No. 2 grade) 16.50c; steel deoxidizing grades, notch bars, granulated or shot; Grade 1 (95-97½%) 17.00c; grade 2 (92-95%) 16.25c; grade 3 (90-92%) 15.75c; grade 4 (85-90%) 15.50c. Above prices for 30,000 lb or more; add ¼c 10,000-30,000 lb; ½c 5000-10,000 lb; ¾c 1000-5000 lb; 1¼c less than 1000 lb. Prices include freight at carload rate up to 75c per 100 lb.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lb) 20.50c per lb, carlots; 22.50c 100 lb to c.l. Extruded 12-in. sticks 34.00c-38.00c.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lb, 1½c 1000-2239, 3½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straights), 70.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05% max. arsenic, 69.87½c; Grade C, 99.65-99.79% incl. 69.62½c; Grade D, 99.50-99.64% incl., 69.50c; Grade E, 99-99.49% incl. 69.12½c. Grade F, below 99% (for tin content), 69.00c.

Antimony: American bulk carlots fob Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 28.25c; 99.8% and over (arsenic, 0.05% max.; other impurities, 0.1% max.) 28.75c. On producers' sales add ¼c for less than carload to 10,000 lb; ½c for 9999-224 lb; and 2c for 223 lb and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.9%, base sizes ex refinery, unpacked 35c lb; 25 lb pigs produced from electrolytic cathodes 36.50c lb; shot produced from electrolytic cathodes 37.50c lb; "F" nickel shots or ingots for additions to cast iron 35.50c lb. Prices include import duty.

Mercury: Open market, spot, New York, $88-92 per 76-lb flask.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be, $14.75 per lb contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks, and all other "regular" straight or flat forms $1.50 lb, del.; anodes, balls, discs and all other special or patented shapes, $1.55.

Cobalt: 97-98%, $1.50 lb for 550 lb (keg); $1.52 lb for 100 lb (case); $1.57 lb under 100 lb.

Gold: U. S. Treasury, $35 per ounce.

Iridium: 99.9%, $2.25 per troy ounce.

Silver: Open market, N. Y. 82.75c per ounce.

Platinum: $58-$61 per ounce.

Palladium: $24 per troy ounce.

Iridium: $110 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 19.50c, Conn., for copper. Freight prepaid on 100 lb or more.)

Sheet: Copper 30.93c; Yellow brass 27.53c; commercial bronze, 95% 31.07c, 90% 30.56c; red brass, 85% 29.53c, 80% 29.02c; best quality 28.44c; Everdur, Duronze, Herculoy or equiv., cold-drawn, 35.79c; nickel silver, 18%, 39.82c; phosphor bronze, grade A, 5%, 48.82c.

Rods: Copper, hot rolled 27.28c, cold drawn 28.28c; yellow brass, free cutting, 22.28c, not free cutting 27.22c; commercial bronze, 95% 30.76c, 90% 30.25c; red brass, 85% 29.22c, 80% 28.71c; best quality 28.13c.

Seamless Tubing: Copper 30.97c; yellow brass 30.29c; commercial bronze 90% 32.97c; red brass 85% 32.19c, 80% 31.68c; best quality brass 30.85c.

Copper Wire: Bare, soft, fob eastern mills, carlots 25.52c, less carlots 26.02c; weatherproof, fob eastern mills carlot 26.42c, less carlots 26.92c; magnet, delivered, carlots 28.93c, 15,000 lb or more 29.18c, less carlots 29.68c.

Aluminum Sheets and Circles: 2s and 3s flat mill finish, base 30,000 lb or more del.; sheet widths as indicated; circle diameter 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers: Full sheets 16.25c, 140 sq ft rolls; add per hundredweight, 25c, 80 to 140 sq ft; 50c, 20 to 80 sq ft; 75c, 10 to 20 sq ft.
Pipe: Full coils 15.50c; cut coils 15.75c.
Lead Traps and Bends: List plus 38%.

Zinc Products: Sheet, 15.75c, fob mill, 36,000 lb and over. Ribbon zinc in coils, 14.75c, fob mill, 36,000 lb and over.

PLATING MATERIALS

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lb to 1 ton 17.75c; under 400 lb 18.25c.

Copper Anodes: In 500-lb lots, fob shipping point, freight allowed, cast oval over 15 in., 36.87½c; flat untrimmed, 36.87½c; electrodeposited, 30.62½c.

Copper Carbonate: 52-54% metallic Cu, 250 lb barrels nom.

Copper Cyanide: 70-71% Cu, 100-lb kegs or bbls. nom., fob, Niagara Falls.

Sodium Cyanide: 96%, 200-lb drums 15.00c; 10,000-lb lots 13.00c fob Niagara Falls.

Nickel Anodes: 500-2999 lb lots; cast and rolled carbonized 51.00c; rolled depolarized 52.00c.

Nickel Chloride: 100-lb kegs or 275-lb bbls 18.00c lb, del.

Tin Anodes: 1000 lb and over nom. del.; 500-999 nom.; 200-499 nom.; 100-199 nom.

Tin Crystals: 400 lb bbls nom., fob Grasselli, N. J.; 100-lb kegs nom.

Sodium Stannate: 100 or 300-lb drums nom. del.; ton lots nom.

Zinc Cyanide: 100-lb kegs or bbls 33.00c fob Niagara Falls.

SCRAP METALS

BRASS MILL ALLOWANCES

Prices for less than 15,000 lb fob shipping point. Add ¾c for 15,000-40,000 lb; 1c for 40,000 or more.

	Clean Heavy	Rod Ends	Clean Turnings
Copper	17.125	17.125	16.375
Yellow brass	13.750	13.250	12.875
Commercial Bronze			
95%	15.875	15.625	15.125
90%	15.750	15.500	15.000
Red brass			
85%	15.500	15.250	14.750
80%	15.375	15.125	14.625
Best Quality (71-79%)	14.625	14.375	.....
Muntz metal	12.875	12.625	12.125
Nickel silver, 5%	14.500	14.250	7.250
Phos. bronze, A, B	18.125	17.875	16.875
Naval brass	13.250	13.000	12.500
Manganese bronze	13.250	13.000	12.375

BRASS INGOT MAKERS' BUYING PRICES

(Cents per pound, fob shipping point, carload lots)

No. 1 copper 17.00, No. 2 copper 16.00, light copper 15.00, composition red brass 16.00, auto radiators 13.00, heavy yellow brass 11.50, brass pipe 12.00.

REFINERS' BUYING PRICES

(Cents per pound, delivered refinery, carload lots)

No. 1 copper, 17.25-17.50c; No. 2 copper 16.25c; light copper 15.00-15.25c; refinery brass (60% copper), per dry copper content, 14.87½-15.25c.

DEALERS' BUYING PRICES

(Cents per pound in ton lots or more)

Copper and Brass: Heavy copper and wire, No. 1 15.50-16.00; No. 2 14.50-15.00; light copper 13.50-14.00, No. 1 composition red brass 14.00-14.50, No. 1 composition turnings 13.00-13.50, mixed brass turnings 9.50-10.00, new brass clippings 13.00-13.50, No. 1 brass rod turnings 11.50-12.00, light brass 8.00-8.50, heavy yellow brass 10.00-10.50, new brass rod ends 12.00-12.25, auto radiators, unsweated, 11.00-11.50, clean red car boxes 12.50-13.00, cocks and faucets 11.75-12.00, brass pipe 11.50-11.75.

Lead: Heavy lead 10.75-11.00, battery plates 6.00-6.25, linotype and stereotype 13.00-13.50, electrotype 11.00-11.50, mixed babbitt 12.00-12.50, solder joints 13.50-14.00.

Zinc: Old zinc 5.50-6.00, new die cast scrap 5.50-6.00, old die cast scrap 4.00-4.50.

Tin: No. 1 pewter 44.00-45.00, block tin pipe 60.00-62.00, auto babbitt 35.00-36.00, No. 1 babbitt 35.00-38.00, siphon tops 38.00-40.00.

Aluminum: Clippings, 2S, 10.00-10.25, old sheets 7.50-7.75, crankcases 7.50-8.00, turnings 4.00-4.25, pistons, free of struts, 6.75-7.00.

Nickel: Anodes 19.50-20.00, turnings 16.50-17.50, rod ends 19.00-20.00.

Monel: Clippings 14.00-15.00, turnings 9.00, old sheet 12.00-13.00, rods 12.50-13.00, castings 10.00.

Sheets, Strip . . .

Shipments of carbon sheets fall two to eight months behind schedule

Sheet & Strip Prices, Page 126

Pittsburgh — Carnegie-Illinois Steel Corp. has revised its new extra card on long ternes, advancing gage extras 10 cents per 100 pounds for gages 21 to 24 inclusive, also for 26 and 27 gage; 25 and 28 gages were increased 15 cents; and 29 gage, 25 cents. No price action has been taken on advancing electrical sheet prices. Some consideration is being given to increasing the Detroit and Eastern Michigan arbitrary price differential. Increased finishing mill capacity scheduled to be placed in operation through first half this year is expected to substantially ease present tight supply situation in sheets and strip. However, sellers do not anticipate any let-up in demand until fourth quarter this year at earliest. In most instances consumers' inventories are well below normal in relation to projected production schedules, although some interests believe this situation could rapidly be reversed should a buyers' strike develop as result of industry again being forced to meet exorbitant wage demands with consequent higher prices necessary to offset rising production costs.

New York—Most sheet producers by drastically limiting quotas for the first quarter — in certain instances revising them two and three times—hope to become fairly current by the end of March. Certain producers entered the new quarter with practically two months arrearages to be worked off, with a result that the great bulk of new commitments will be for March shipment only and will be on a much smaller scale than originally contemplated. Some rated tonnage is still being received for shipment in this quarter, although relatively small and scattered. It is generally assumed little or no rated tonnage will be placed for the second quarter.

A relatively small advance in stainless steel has been announced in some quarters; others may take somewhat similar action. An increase in electrical sheets also is expected although no action has yet been announced in any quarter so far as can be learned.

Boston—One eastern cold-rolled strip producer has gone off the Worcester base on 0.51 carbon and over, billing New York city. Most producers are now quoting 4.75c, Worcester, on low-carbon flat wire, 0.25 carbon and less, a cold-strip classification, ½-inch and less with a prepared edge. Supplies of hot-rolled strip in low carbon grades for cold reducing are meager and off schedule, rerolling operations being subject to frequent revisions. Inventories in most instances are low and consumers are pressing for delivery. Outright resistance to price advances is not strong but confusion is widespread. With heavy carryovers in both sheets and strip, mill schedules are filled for the first quarter and new buying is light. A substantial tonnage is held in abeyance for second quarter scheduling.

Cincinnati—Sheet mills are holding to the new price schedule recently announced despite increases in scrap and other costs. It was conceded that any further additions to costs would likely mean upward revisions in sheet prices. Strong pressure is being exerted for schedule positions and for deliveries, although there appears little prospect for freed tonnage during the first quarter.

Birmingham — Sheet production is making a valiant but futile effort to keep abreast of demand. Need for sheets is heavier than at any time in history. Relief is in the offing in the conversion of a Fairfield mill from hot to cold-rolled, but even then an adequate supply is not in prospect.

Brokers' High Priced Sheet Offerings Find Few Takers

Cleveland — Quantities of both hot and cold-rolled sheets are being offered by brokers in this area at high prices but are finding few takers.

One consumer reported an offering of 1500 tons of 20 and 22-gage sheets out of stock in Pittsburgh, Detroit and Cleveland for immediate delivery and 5000 tons of one size for first quarter. Prices range from $180 for hot-rolled to $260, $320 and upward a ton for cold-rolled. In one instance a large user was offered his choice of 20 or 22-gage cold rolled at prices varying from 10.00c to 12.50c, fob Pittsburgh. Sheet producers are holding strictly to published prices. Consumers speculate that misuse of CPA ratings may be one reason for the appearance of quantities of steel in the broker market at premium prices.

One lot of cold-rolled steel has been offered by a baking company in the central west. Source of this lot of steel remains a mystery.

High-Strength Low-Alloy Steel Prices Advance

Pittsburgh — Carnegie-Illinois Steel Corp. has raised high-strength low-alloy steel prices and revised extras to conform with new carbon steel extra cards for respective products, effective on shipments as of Jan. 7.

Details of price revisions, which do not include the average switching charges of 5 cents per 100 pounds at Pittsburgh and Chicago and 3 cents, Youngstown, are as follows:

Price base on plates is $4.10 at Pittsburgh and Chicago, compared with former price of $3.45 per 100 pounds; shapes $3.85 at Pittsburgh and Chicago against $3.45; bars and small shapes $4 at Pittsburgh, Chicago and Youngstown, compared with $3.70 for rounds, squares and flats and $3.85 for bar shapes; hot-rolled strip $3.85 at all three points, against $3.60 for 6 inches and wider and $3.70 for narrower; hot-rolled sheets $3.85 at Pittsburgh, Chicago and Youngstown, compared with $3.575; cold-rolled sheets $4.75 at Pittsburgh and Chicago, against $4.525. Company has established a price base of $5.40 per 100 pounds for 10 gage galvanized sheets at Pittsburgh. Formerly the price was $5.50 for 24 gage base, and 10 gage price was $5. Schedule of coating extras apply as in carbon galvanized sheets.

The price advances detailed above tend to restore the ratio of 1.5 to 1 between respective price bases of high-strength low-alloy and copper steels in achieving approximate equal material cost when about 30 per cent weight saving is effected. Price base ratio between these two types of steels was drastically altered during the war period by reason of advances in carbon steel prices without corresponding increases in price base of high-strength low-alloy steels. This ratio has been determined through extensive study of material costs to consumers in this substitution of higher strength, corrosion resistant steels for carbon-copper steel in weight saving applications.

Demand for high-strength low-alloy steels expanded steadily throughout the past year. Carnegie-Illinois Steel Corp.'s output for instance was 3 times greater than for any previous year. Demand outlook for 1947 is held very promising based on prospective increase in freight car construction and other applications. Use of these steels in construction of ships, bridges and office buildings has been relatively minor to date but prospects are promising. There is a possibility one large bridge, now up for bids, may be contructed from these steels.

Steel Plates . . .

Base prices advance $3 a ton; applicable extras also revised upward

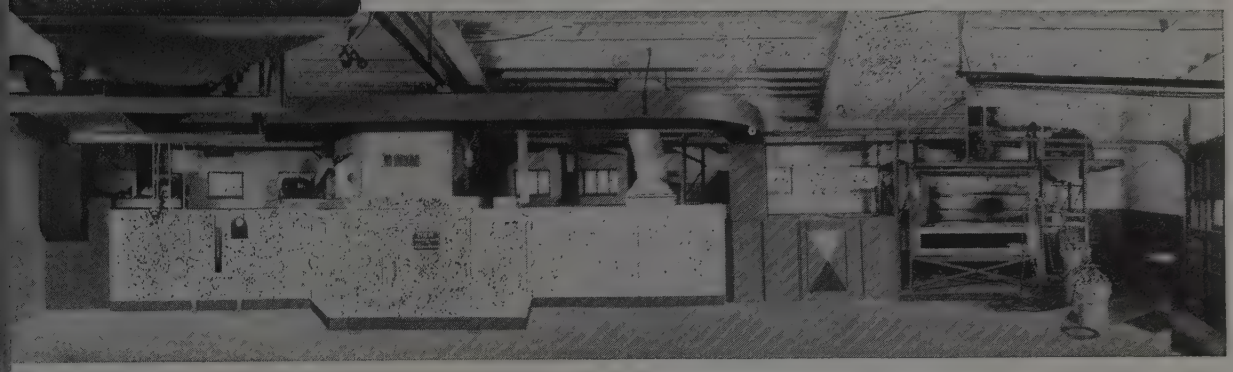
Plate Prices, Page 127

Pittsburgh—Carbon steel plain plates recently have been advanced $3 a ton to a price base of $2.65; floor plates to $3.90. Applicable extras also have been revised upward. An entirely new list of classification extras has been established. Quantity extras are now set up on an item quantity in contrast to order quantity basis, and new ranges established. There is a new base range of ⅜ to 1½-in. thickness extra. Width extras apply for under ⅜-in. and over ⅜-in. Length extra base now is 8 to 60 feet with general increases noted throughout entire range. Circular and sketch plate extras are up about 10 per cent. Flame cutting extras nominally increased for thickness under 7 inches; unchanged, over 7 inches. Blast cleaning extras are changed from per pound to square foot of surface area. Chemical extras closely follow the shape extra card. Quality extras include classification extras. Pickling extras have been advanced.

New York—Two large producers of carbon plates have recently advanced their prices $3 a ton to 2.65c base while another producer, at Conshohocken, Pa., has advanced his price $3 a ton, base, to 2.80c, bringing his price to the same level as that quoted by two other eastern independents. Present New York minimum delivered price is 2.94c based on a 2.65c price at Sparrows Point and a 0.29-cent freight rate.

Philadelphia — While a wide spread exists in eastern basing point prices of plates, the market nevertheless is becoming more competitive in certain respects. Thus, two leading producers have advanced their base prices $3 a ton, to 2.65c per pound, another has increased his price $1 a ton to 2.80c equalizing with two others in the immediate district, and Sparrows Point is now being more generally recognized as the governing basing point here with its 2.65c, base, and its 0.20 cent freight rate into this city, making for

ANOTHER OUTSTANDING DSM INSTALLATION



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Drying from center outwards avoids case hardening

WE WANT TO BUILD ***YOUR*** *OVENS*

PLANT ENGINEERING: *Consulting assistance in plant layout to coordinate departmental operations, our experience dated from 1917 in this field.*

Such plant layout may be based on increasing production beyond present capacity, or it may be a rearrangement in this post-war period when operations are conducted under a new set of conditions.

MOTOR CLEANING EQUIPMENT: *Washing machines for cleaning teardowns. Kerosene spray or similar solvent usually used as the cleaning medium.*

FORMED COWLINGS, PANELS, ETC.: *To your specifications, and of light metal alloys as required. Weldments and brazed assemblies may be under controlled atmosphere.*

PILOT EQUIPMENT: *Sample size equipment for development of heavy equipment.*

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delivered price of 2.85c. Normally, Claymont, Del., is the governing basing point, but with its base of 2.80c, it is still a point higher notwithstanding its comparatively small freight rate into Philadelphia, now 0.06 cents. Meanwhile, one eastern Pennsylvania mill continues to maintain a substantial premium, having advanced its price $7 a ton from 3.05c to 3.40c, basing points.

Boston — Tank fabricating shops are paying $6 a ton more for ⅞ and ¼-inch plates and ⅜-inch is even higher with a 40-cent extra. Base thickness is ⅜-inch. These increases cover a substantial ratio of tonnage consumed in this territory with demand for small tanks holding at a high level. Indications are plate fabricators will continue short of material most of this quarter. Fourth quarter carryover is substantial and shipments were down, notably to warehouses, during that period.

Sellers of floor plates have advanced their prices $3 a ton to 3.90c, base. In addition to increases in base prices plate producers generally have revised various extras, which are now being carefully studied by the trade. However, despite changes in the price structure, there is still a strong demand, with some producers offering third quarter as the best they can do on new tonnage. At least two mills, operating on a quarterly basis, are temporarily out of the market, pending the opening of books for the second quarter, which should come within the next two weeks.

Birmingham — Plate production has returned to virtual capacity in this section but continues to lag behind demands. Car production and ship building and repairs continue to account for a sizable tonnage. The effects of the recent coal strike have not been overcome and there is little evidence of appreciable slackening in demand.

Seattle — Plates are scarce and in strong demand mostly for tank and boiler jobs. Shops have fair backlogs but are handicapped by low inventories. Cottage Grove, Oreg., has opened bids for 31,000 feet of 14-inch steel water pipe. Seattle has appropriated $600,000 for the Bow Lake airport water system extension involving 48-inch steel water pipe. Previous bids were rejected, on account of cost, and plans revised.

Steel Bars . . .

Bar Prices, Page 126

Pittsburgh — Carnegie-Illinois Steel Corp. in establishing a price base on carbon and alloy bars at Youngstown for those sizes and ranges produced there has in effect discontinued selling under the Mahoning Valley base differential, which was 7.5 cents per 100 pounds above the Pittsburgh and Youngstown base for all sizes. Some consideration also is being given to advancing the Detroit and eastern Michigan delivered price arbitrary differential, but no official action has been taken. Confusion is still present in the interpretation of both carbon and alloy hot and cold-rolled alloy bar extra cards. This is particularly true as to what constitutes a "killed" steel and in the application of various chemical requirement extras. Cold finishers state production schedules are back to normal following the brief curtailment over yearend holidays. At least one plant shut down for a full week in effort to bring depleted inventories in better balance. Most mills are extended well into next year on carbon bar order backlogs, notably in smaller size ranges. Alloys are available late this quarter.

Carnegie-Illinois Steel Corp. and Sharon Steel Corp. raised tight cooperage hoop price base to $2.80 per 100 pounds, Youngstown, an advance of $5 per ton. Applicable size extras also were revised. Carnegie advanced slack barrel hoops an average of $16.40 per ton at Youngstown; tobacco hogshead hoops, an average of $2.59 per 100 hoops. An extra of 65 cents is now charged for painting slack barrel hoops, against the former extra of 25 cents. Nail hole punching is up 5 cents; cleaning, 10 cents. Prices for slack barrel and tobacco hogshead hoops have been revised to reflect the new hot-rolled strip extra card.

Boston—Impact of applying bar extras is heaviest with distributors. Some are ordering random lengths, taking 10 per cent in shorts. Mills are not uniformly charging extras for killed steel regardless of specification. There are some revisions in specifications to avoid extras. Carbon bars, 1-inch and under, are extremely scarce.

Philadelphia — Bar consumers are still in the throes of analyzing the new changes in price extras, and while demand appears as pressing as ever, indications are that various changes in buying practice may result as time goes on as buyers endeavor to minimize as much as possible the cost effects of the new schedules. Meanwhile, sellers are receiving numerous requests for interpretations. With a rate from Pittsburgh of 0.38c, the delivered price on commercial carbon bars is 2.98c, Philadelphia.

Chicago — Consumers are still confused by the new extras on steel bars, mills having individual methods of figuring prices. It will require time and patience to effect clarification. In the meantime, users are surveying their fabricating requirements to determine how they can reduce the extra charges. Chief among these are the ones dealing with chemistry and length. Yearend carryovers of carbon bars in the smaller sizes runs about 30 days, a situation which was aggravated by the coal strike. Alloys are in comfortable position because of lighter demand.

St. Louis — Barmakers resumed capacity production last week following completion of repairs which had curtailed output the previous two weeks. Merchant bar tonnage will be at a lower level this year, however, because the leading producer is cutting bar output for an indefinite period to five or six per cent of mill capacity and making corresponding increases in pipe and wire tonnage, in which the profit margin is better. Hence, bar schedules are filled for 1947. Price increases have brought no abatement of pressure for bars, but mills are noting more caution among buyers in respect to inventories. Small sizes remain in greatest demand and shipments in December were on the increase except for the holiday shutdowns.

Tubular Goods . . .

Tubular Goods Prices, Page 127

Pittsburgh — In addition to upward price revisions in hot and cold-drawn carbon seamless mechanical tubing, Babcock & Wilcox Tube Co. and other producers have established new base discount schedules for hot and cold-rolled electric welded carbon steel pressure tubes. Lap welded black steel pipe has been raised $10 a ton for sizes 6⅝-in. and smaller; $8 a ton in size range 8⅝ to 12¾-in. Galvanized lap welded steel pipe is up $14 a ton in size range 6⅝-in. and smaller; $12 for 8⅝ to 12¾-in. New prices are quoted on page 127.

Gary, Ind., is now quoted as a base on welded pipe only for sizes made in that district.

New York—Westchester Lighting Co. has closed on 2500 tons of 24-inch steel pipe to Bethlehem Steel Co.

Canton, O.—Steel and Tube Division of the Timken Roller Bearing Co., this city, has announced a revised schedule effective as of Jan. 3 on alloy seamless mechanical tubing for the manufacture of antifriction bearings.

Youngstown — Youngstown Sheet & Tube Co. has increased prices of steel pipe $6.50 to $9 a ton. These advances follow similar action taken by other leading producers. The increases were made necessary by sharp increases in production costs, including scrap and higher freight rates.

Seattle—Cast iron pipe demand continues strong but many jobs are being deferred because of uncertain delivery and high costs. H. G. Purcell, Seattle, has been awarded 450 tons 4 to 12-inch cast iron by Bremerton, Wash., delivery 18 months. Bids are in for 200 tons to city of Seattle and 156 tons for Bellingham, Wash. Yakima, Wash. will open offers Jan. 15 for 150 tons.

Wire . . .

Revisions in extras lift cost of common nails an average of $5 a ton

Wire Prices, Page 127

Pittsburgh—Jones & Laughlin Steel Corp. has followed action taken by other producers in advancing prices for manufacturers and merchant wire items. Pittsburgh Steel Co. soon is expected to announce a somewhat higher price schedule. No change has been made in price base for common nails, but advances in extras are estimated to average about $5 per ton. The new size extra for 8 penny common nails has been increased from 50 to 85 cents, or $7 a ton; special roofing nail size extras are up as much as $26 a ton in some instances. Price base for annealed merchant quality wire in coils is now $3.95 per 100 pounds, compared with $3.50; galvanized, $4.40 against $3.85. Barbed wire is up $15 a ton, woven fence $12.

With most consumers' inventories of wire products well below immediate needs and no let-up in demand indicated through most of this year, there has been little resistance to recent upward revisions in price base for manufacturers and merchant wire items. Some opposition to the new extra card schedules is noted, however, and this trend is expected to become more prevalent with consumers revising specifications to avoid specific extras. The new extra cards incorporate revisions in size extras, cutting and straightening, packaging, restrictive analysis, quality and quantity extras.

Little improvement in supply of merchant and manufacturers wire is indicated for early months this year. How-

ever, some producers believe a slight increase in output of lighter gage wire may develop. Nonintegrated interests expect wire rod supply to remain very scarce through first half at least. One producer recently eliminated the Chicago base for sale of manufacturers wire items. Year end mill carryover tonnage for both manufacturers wire and merchant products was very heavy in most instances, despite fact some companies booked no new orders during last half of 1946. At least one producer is scheduled through 1947 on manufacturers wire in smaller sizes.

New York—When fully digested, increases in some grades of wire specialties are found substantial. In case of steel wool wire the advance is said to approximate $29 a ton. Pressure of wire product deliveries continues with demand for upholstery wire notably heavy. Most producers of screws are seeking more rods or finished wire, there being a tendency toward the latter in view of tightness in the rod supply. Automobile industry and its suppliers are also pressing for shipments.

Boston—Clarification of price structure has not reached a point where most users are certain as to the extent of increased steel costs this quarter. Multiplicity of wire products, many subject to revised extras, complicates analysis of costs. Pressure for delivery is strong, but new orders are slightly slower pending removal of price uncertainties. On many products, mills are sold through the first quarter on a quota basis and carryovers are substantial, despite elimination of considerable delinquent tonnage from backlogs. Large increase in music wire capacity is reflected in relatively better deliveries of some grades, first quarter shipment being possible with some mills. In addition, at least two producers have started production of music wire in other areas. Wire rod supply is not improving materially with nonintegrated mills, most of which have difficulty in holding to tentatively established schedules. Although geographical factors are involved, contributing to the shortage in rods is also the fact that most integrated producers have increased drawing and cold reduction capacity and are using more of their own rods.

Chicago—In view of the recent increase in wire prices, particularly the new extras, consumers are seeking full information and apparently sharpening their pencils to figure how they can save money by changing analyses and eliminating some of the extras. Meanwhile, there is no lessening in demand for wire products, but there is renewed pressure for delivery of material on order. Demand for nails and fencing tops all products.

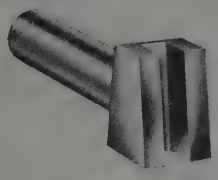
Birmingham—Wire product demand continues unabated, although the weather has somewhat slowed up general repair work on the part of agricultural interests. While considerably eased from the peak, nails are still in short supply. Drawn wire in most instances remains at a premium. Some tapering off is noted in demand for wire fencing.

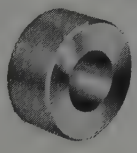
Reinforcing Bars . . .

Reinforcing Bar Prices, Page 127

Chicago—While reinforcing steel suppliers at year end were predicting increased demand early this year, there is

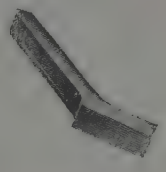
miracles and "Soluble" Cutting Compounds





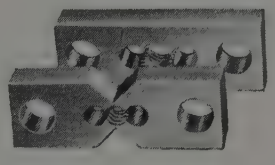
Solvol and KleenKut, Stuart's water-mixed cutting fluids, while they share in many a machining "miracle," are not "miracle" compounds. They *are* expertly engineered and manufactured products, whose performance is unsurpassed among water-mix, or "soluble" cutting fluids.

Stuart's Solvol, a "super soluble" because of its unusually high cutting quality, will handle jobs beyond the scope of conventional water-mix products, including many so-called all-purpose compounds.



Stuart's KleenKut, a more conventional product, is still an outstanding "soluble" cutting compound with a long record of superior performance.

Try Solvol or KleenKut water-mixed cutting fluids the next time you want a machining "miracle."



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no evidence as yet that this is developing and there is certainly no indication that steel supply from mills will improve enough to accommodate the handling of a much larger volume of business. Little progress is being made in reducing the backlog. It is estimated that it will be late 1947 at the earliest before steel supply and demand are in balance.

Structural Shapes . . .

Revision in extras accompanies advance of $3 a ton in base prices

Structural Shape Prices, Page 127

Pittsburgh — Carnegie-Illinois Steel Corp. has raised price base on structural shapes $3 a ton to $2.50 at Pittsburgh and Chicago, and also advanced applicable extras. Other leading producers have followed Carnegie's price action. Salient features of the extras are as follows:

New extras are now charged for certain ranges of standard shapes where formerly none were charged. In general size extras have been revised upward, with greater advances noted in lighter sizes. Extras for splitting beams and channels increased, particularly on light weight sections. Wide flange beam size extras up $1 a ton. A new item quantity extra range of "under 4000 to 2000 pounds, inclusive" has been added, and all extras for various ranges increased. Restricted physical test requirement extras have been changed to agree with AISI manual. Test requirement extras now include a hardness-test extra of 15 cents and same amount for excess tension or bend tests when location of tests other than standard are specified. The maximum of the range now determines the chemical requirement extras; copper and manganese extras have been increased. Bundling and loading extras also have been established.

New York—Recent advance of $3 a ton in shapes to 2.50c, leading basing points, has resulted in an advance in the delivered price here to 2.70. This is predicated on the new 20-cent freight rate from Bethlehem, the governing basing point for this area.

Leading awards include 5000 tons for a gas holder at Glenwood Landing, Long Island, placed with Bethlehem Steel Co., Bethlehem, Pa., and 2100 tons for a 19-story apartment at Fifth Ave. and 59th St., placed with Harris Structural Steel Co., this city.

Inquiry is broadening, although various projects are being held up pending better stabilization of labor and materials costs and a more definite prospect as to deliveries, especially on such building components as electrical fixtures, hardware, etc. Meanwhile, most fabricators still have considerable backlogs, with some of the larger interests unable to promise shipments against new commitments before August.

Among larger projects likely to become active within the next several weeks are a state bridge at Roslyn, Long Island, requiring between 4000 and 5000 tons, and municipal pier 79, along the Hudson River.

Boston—In line with other costs, estimates for erecting structural steel are well above prewar levels. For a 100-ton bridge, Presque Isle, Me., high bid for

erection was $17,343.25 and low $10,726.75; both rejected. Contract for the steel delivered was $16,842, below highest bid for erecting. New inquiry for fabricated structural tonnage lags; tightness in smaller plain material will continue through the quarter, but in spots mills are beginning to make some progress against backlogs in other ranges. Footage weights rolled are still below normal average in most cases. Demand by district shops centers largely in smaller and lighter material, heavier sections being more prominent in larger contracts placed by contractor-engineers for power plants and engineering construction.

Philadelphia — With the leading district producer having advanced his price $3 a ton in line with action taken by another large seller, to 2.50c, base, the delivered price here on shapes is now 2.64c, predicated on the new freight rate of 0.14 cent from Bethlehem, Pa. Another district seller apparently is marking time, having made no change in its published price of 3.05c, Bethlehem base equivalent.

While the structural building outlook is more promising, orders locally have been spotty for some time. However, most fabricators have substantial backlogs. Recent inquiries include 400 tons for a diesel locomotive shop at Altoona, Pa., for the Pennsylvania railroad, and 300 tons for a research and office building for the Du Pont interests at Waynesboro, Va.

Chicago—The increase of $3 a ton plus higher extras in the mill price of structural steel is not expected to have noticeable effect in building construction. The increase will, of course, be passed along by fabricators to their customers, but it is not enough of an increase to discourage construction. Fabricating shops already have more business than they can accommodate in view of steel supply received from mills. Backlogs are appreciable, having been swelled by production lost during the coal strike. One of the difficulties is that mill shipments do not come in full ranges of sizes and fabrication is held up while certain sizes are awaited.

Seattle—Supply of shapes is far below requirements and delivery of materials is slow and uncertain. Shops are working on low inventories and taking new business in small lots. Pacific Car & Foundry Co. will begin work on 1250 refrigerator cars, contract for which was placed months ago and delayed for lack of materials. This shop has a $9 million backlog. It will furnish 200 tons shapes for a paper mill project at Camas, Wash.

Rails, Cars . . .

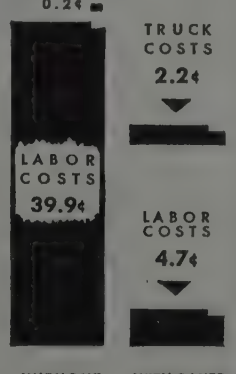
Track Material Prices, Page 127

Washington — Steel industry executives and government officials met last week to discuss the need for new freight cars, freight car repairs and other urgent steel requirements. Officials of the Office of Temporary Controls estimated prior to the meeting that about 7000 new freight cars will be required each month this year to meet minimum needs of the railroads. They stated that the nation's roads have not made any substantial progress since V-J Day in replacing their worn-out rolling stock. Freight car output dropped to 3828 units in October from 4016 in September and officials es-

COST OF MATERIAL HANDLING

Per ton—based on 180 tons per day

In addition to these savings, Baker Trucks reduce warehouse rental charges by tiering, contribute to plant safety, speed production and material movement, and perform many other operations that reduce plant overhead.



Handling conditions vary for each particular plant. Your own problem should be presented to an experienced material handling engineer. However, the following example outlines a simple method for determining the savings possible with an electric industrial truck. Let us assume a hypothetical plant with the simple problem of transporting daily 180 tons of material 200 feet from stockrooms to processing machines. Without power trucks this would require 10 truckers, each making 10 round trips per hour, or 80 trips per day, carrying 450 lbs. of material per load.

TABLE I—*Handling Costs Without Electric Truck*

Based on 180 tons per day	*Cost per day*	*Cost per ton*
Labor (85¢ per hour)	$68.00	$0.378
Social Security Taxes	2.72	0.015
Workmen's Compensation	1.00	0.006
Hand Truck Depreciation	0.30	0.002
Total	$72.02	$0.401

In order to mechanize handling operations, the following equipment would be required:

TABLE II—*Cost of Equipment for Mechanizing*

Fork Lift Truck 2000-lb. capacity	$4,100.00
Battery	600.00
Charging Equipment	840.00
200 pallets	700.00
Total	$6,240.00

The truck, handling one-ton pallet loads of material, making 24 round trips per hour, could transport the 180 tons in 7½ hours.

TABLE III—*Annual Expense—Truck Operation*

Depreciation—Truck at 10%	$410.00
Battery at 20%	120.00
Charging equipment at 6⅔%	56.00
Pallets at 20%	140.00
Tires	100.00
Repair and Maintenance—Truck	164.00
Battery	24.00
Charging Equipment	33.60
Replacement of damaged pallets	70.00
Electricity	82.00
Insurance	10.00
Total annual expense	$1,209.60
Expense per day	4.03

TABLE IV—*Handling Costs—With Electric Truck*

Based on 180 tons per day	*Cost per day*	*Cost per ton*
Labor (Driver—$1 per hour)	$8.00	$0.044
Social Security Taxes	0.32	0.002
Workmen's Compensation	0.16	0.001
Truck Expense	4.03	0.022
Total	$12.51	$0.069

TABLE V—*Savings With Electric Truck*

Savings Per Ton	$ 0.332
Savings Per Day (Handling 180 tons)	59.51
Savings Per Year (300 days)	17,853.00
Per Cent Reduction in handling costs	83%
Annual earnings on investment	286%

While this example is obviously oversimplified, Baker Material Handling Engineers are prepared to show you how similar savings can be made on handling operations in your plant.

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timated that at the October rate the domestic order backlog of 69,000 cars would require almost two years production.

Bolts, Nuts . . .

Bolt, Nut, Rivet Prices, Page 127

Cleveland—Prices in the bolt and nut market have stabilized sufficiently so that it now can be quoted at a fairly representative level, although there are still deviations on some items. The new schedule is quoted on page 127 of this issue and includes new nut designations, "A. S. Light" is substituted for "S. A. E." while "A. S. Regular and Heavy" is substituted for "U. S. S."

Discontinuance or Sharp Cut in Refined Nickel Tariff Proposed

Discontinuance, or at least a 50 per cent reduction, of the 2½ cents per pound import duty on refined nickel will be considered in forthcoming reciprocal trade agreement negotiations scheduled to get under way Jan. 13.

Domestic consumers would benefit from elimination of this duty to the extent of about $2.5 million annually, for International Nickel Co. has announced whatever action is taken will accrue entirely to its customers. Removal of the duty would stimulate production of a wider range of high-quality products and aid manufacturers to maintain present price levels in face of other rising production costs.

Direct beneficiaries from lifting of present import nickel duty would include some 1300 steel and nonferrous mills, foundries, platers' supply houses, makers of heat and corrosion-resisting alloys, magnetic and nonmagnetic alloys, aluminum alloys, controlled expansion-type alloys, as well as chemical and electro-chemical industries using nickel as catalysts. The benefit will extend in turn to all applications in which nickel alloys and materials are used in modern equipment.

The great bulk of United States nickel requirements is served by the nickel mines of Ontario, Can., where nickel is mined, smelted and refined in electrolytic cathodes ingots, and shot for export. There is no nickel mined or refined in the United States and therefore the duty is not a protective tariff. For this reason major users believe there will be little opposition to reduction of present import duty.

Over 100 million pounds of refined nickel, subject to duty, were imported into the United States in first 10 months last year. Direct consumers of refined nickel fall into following main divisions and distribution among them of the deliveries for first 10 months of 1946 was in the following approximate percentages: Steel mills, 38 per cent; nonferrous mills, 32; heat-resisting alloy producers, 9; platers' supply houses, 6; iron foundries, 5; steel foundries, 3; special alloy producers, 1; chemical producers, 1; and others, 5 per cent.

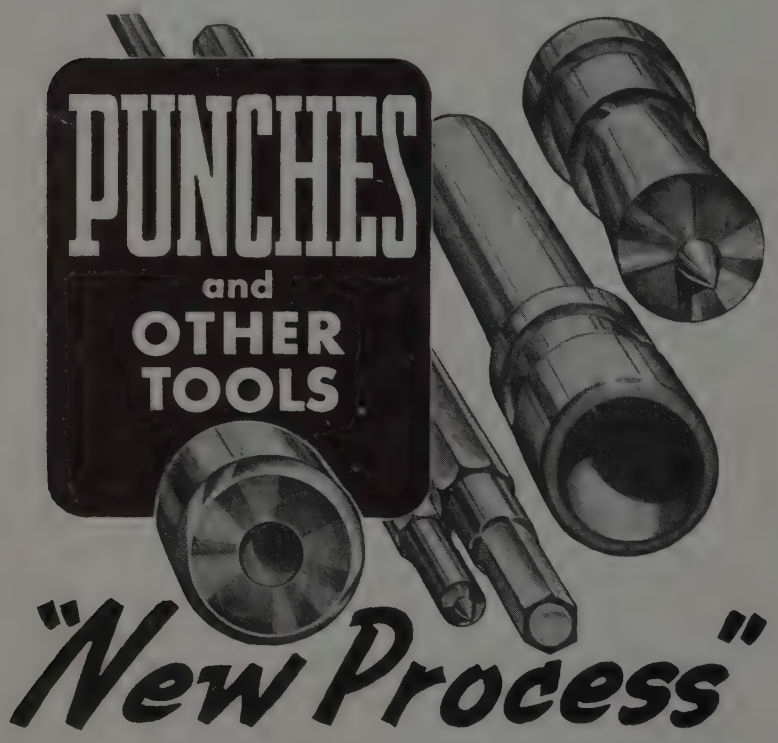
Commercial production of cast iron and cast steel rolls in the United States, excluding those produced by steel companies for their own use, runs from 125,000 to 150,000 net tons annually; only about 10 per cent of which are not alloyed. The other 90 per cent include nickel in amounts of from about 1 to 5 per cent. The industry's annual nickel requirements approximate 10 million pounds, but since some of the alloy is retrieved from scrap rolls returned to producers, requirements of virgin nickel amount to about 5 million pounds.

Nearly all high alloy castings contain nickel in substantial amounts.

Demand for nickel held up better than anticipated in the immediate postwar months, and is steadily increasing. International Nickel Co. Inc. states world deliveries of nickel last year compared favorably with 1945. The company's operations dropped to around 50 per cent of capacity immediately following termination of hostilities, but since have recovered to about 75 per cent.

The United States Department of Interior, Bureau of Mines, reports nickel pigs, ingots, shot, etc., imported in the United States totaled 186,104,935 pounds in 1944 and 156,804,166 in 1945. Imports for 1946 are estimated at around 125 million pounds.

Nickel was first mentioned in the Tariff Act of 1846 when the duty was 5 per cent ad valorem. It was raised to 10 per cent in 1862 and to 30 cents



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pound (about 40 per cent on an ad valorem basis) in 1870 to protect nickel mines in Pennsylvania which have since been exhausted. Since then the duty has been reduced gradually to the present level of 2½ cents per pound.

Nonferrous Metals . . .

Nonferrous Prices, Page 131

New York — Price advances in lead and fluctuation in silver and platinum prices featured nonferrous metal markets last week.

Copper — Supply outlook for copper in the second quarter is obscure. By the end of March, stockpile will be depleted at the current rate of withdrawals, about 50,000 tons a month, and early action by Congress on tariff revision is doubtful. Despite the prevailing four-cent per pound import tax, some buying of foreign copper for domestic account is reported. A substantial tonnage of foreign metal is being sold at prices ranging from 19.75c to 20.00c, fas, and in some instances even higher. Reflecting the Jan. 1 freight rate increase and handling charges, the differential is 0.275c per pound below the delivered price, New England, on the refinery quotation for domestic metal.

Lead — Price of lead has advanced to 13.00c, New York, from 12.55c, reflecting heavy demand and higher prices in the foreign market. The increase at St. Louis is to 12.80c. Around 7000 tons will be released this month from government stocks to bridge the gap between the end of controls and resumption of private buying of foreign lead. Foreign stocks of lead are low and the British raised the home market price to £70 per long ton, or about 12.60c per pound. Stocks at smelters and refineries in the United States Dec. 1 totaled 185,929 tons compared with 185,046 tons in the previous month. This includes lead in ore, matte, in process, base bullion, refined pig lead and antimonial lead.

Zinc — Price undertone is strong with the foreign market slightly higher. Those domestic consumers who are buying special high grade plus duty pay what amounts to a premium over the domestic quotation. The domestic prime western price, however, held unchanged on the basis of 10.50c, East St. Louis. Shipments in December reached 89,574 tons of which 12,300 tons were export and drawback metal. Production rose to 70,-997 tons from 66,818 tons in November. Stocks of slab zinc declined from 195,-305 tons at the end of November to 176,-128 tons on Dec. 31.

Tin — Dutch interests expect to increase production of tin concentrates in the Netherlands East Indies by the end of this year to an annual rate of 51,000 long tons. About 25 per cent of this total will be shipped to the Texas smelter. Price of this concentrate tonnage will be on the basis of 70.00c per pound of tin contained, Gulf ports. Largest tin dredge ever built was launched at Tampa, Fla., Jan. 7. The British have ended the purchasing of concentrates in Malaya.

United States imports of tin from the Far East amounted to only 2474 tons during the first nine months of 1946, or about 5 per cent of the prewar average. During the same period, imports from all sources amounted to 38,512 tons compared with 32,022 tons during the like 1945 period. Bolivia continued its wartime position as a principal source.

Pig Iron . . .

Electric furnace silvery pig iron prices advance $2.75 per gross ton

Pig Iron Prices, Page 129

Keokuk, Iowa — Effective Jan. 1, Keokuk Electro-Metals Co. increased prices on electric furnace silvery pig iron $2.75 per gross ton on all grades. On the Jackson, O., basis the new price schedule is as follows for the various grades designated by percentage of silicon: 14.01-14.50%, 52.75c; 14.51-15%, 53.75c; 15.01-15.50, 54.75c; 15.51-16%, 55.75c; 16.01-16.50%, 56.75c;16.51-17%, 57.75c; 17.01-17.50%, 58.75c; 17.51-18%, 59.75c. Prices are 1.25 cents higher at Buffalo and 3.25 cents at Keokuk, Iowa.

Philadelphia — With district pig iron producers generally quoting on an fob furnace basis, there is a spread in delivered prices in Philadelphia. However, the minimum delivered prices on foundry, basic and malleable are $32.51, $32.01 and $33.01, respectively, predicated on a $1.01 freight rate from Swedeland, Pa.; and on low phos, $37.49, based on a rate of $1.49 from Birdsboro, Pa. The delivered price on southern foundry iron is 38 cents less than that for northern foundry iron.

Pig iron production in the district is now at the highest rate in more than

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two months, with both the Birdsboro furnace and the smaller stack at Swedeland back in operation. However, rated tonnage is heavy and consumers without priorities are having considerable difficulty getting iron. One district steel mill was down for several days recently because of lack of iron. Scarcity of foundry scrap and difficulty of getting it at anything like a reasonable price is causing consumers to exert added pressure for pig iron.

New York—While pig iron production is expanding somewhat as compared with the average December rate, requirements are broadening in even greater proportion, with a result that there never has been greater stringency in iron than at present. The situation is further aggravated by a continued acute shortage of foundry scrap.

Pittsburgh—January pig iron directive tonnage for federal housing program shows little change in volume from two preceding months. Blast furnace interests believe distribution of iron under present directive system will be continued at least through first quarter. Due to critical cast scrap shortage and abnormal high prices for limited material available, most foundries are seeking to increase ratio of pig iron in their operating practice. However, pig iron is in nearly as short supply as scrap and foundry coke. In addition to the advances in prices for cast scrap and pig iron in recent months, foundries have had to absorb higher freight charges on incoming raw materials plus a $1 to $1.50 per ton advance in beehive and by-product foundry coke prices. As a result prices for gray iron, malleable and steel castings have been increased 10 to 20 per cent. Foundries have not been able to make much headway against record order backlogs in recent weeks due to continued scarcity of basic raw materials and little improvement in overall supply of these materials is indicated this quarter.

Boston—Although shipments by the Everett furnace are heavier, attainment of balance in pig iron supply is retarded by withdrawal of deliveries by several outside furnaces. Tonnage from the Buffalo area is lower, although limited shipments of basic iron by New York furnaces keep steelworks going on narrow margins.

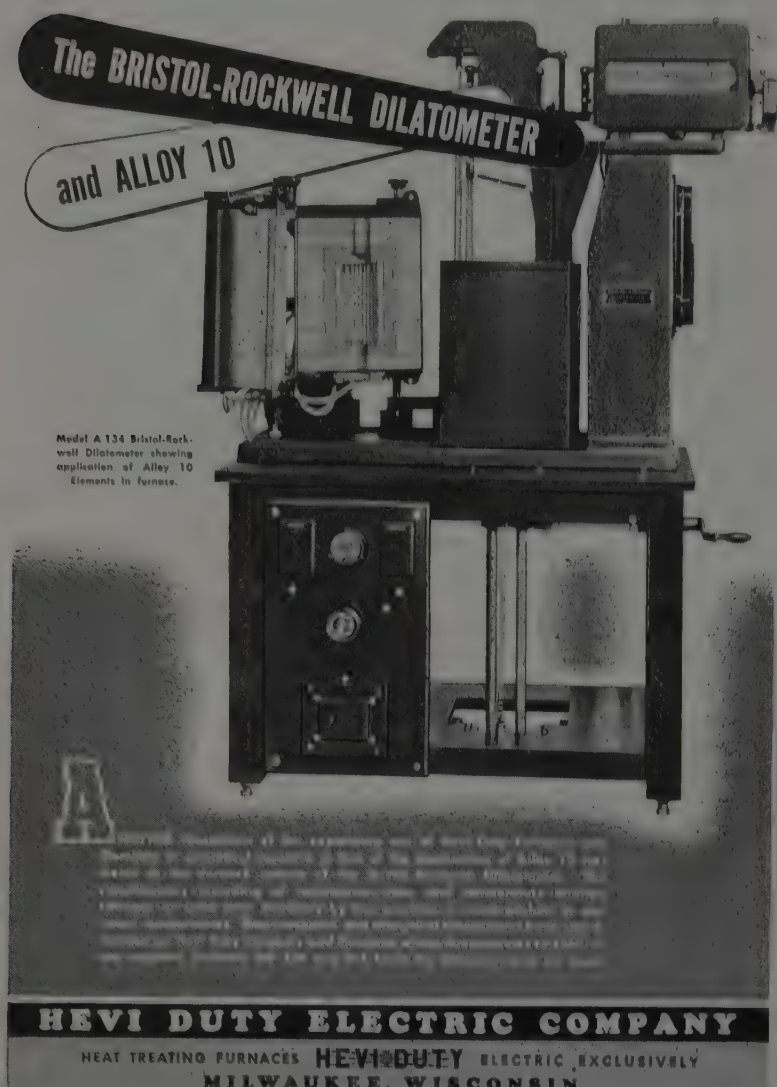
Chicago — Foundry operations are considerably below the level which prevailed before the coal strike, solely because supply of pig iron is far short of melting requirements. Producing castings as long as possible during the strike, foundries exhausted iron inventories. Blast furnaces banked during the strike were slow to resume because coke was lacking. Only last week did level of iron production get back to that prior to the strike.

Buffalo — With the direct leading merchant iron producers still operating at only 50 per cent of capacity, the rate in effect since the recent coal strike, many foundries have been hit hard. Some are down to only two or three days a week because of the lack of iron. The producer has relighted the two furnaces that were idle during the coal tieup, but two other units have been forced down for repairs. This producer also faces a coke shortage problem. Foundries are pressing for iron and substituting scrap or silvery iron whenever possible. Increased freight rates are being passed along to consumers as sellers adopted an fob foundry schedule. Buffalo delivered prices are placed on all contracts. Freight charges are paid by the receiver.

Birmingham—Pig iron production in this district has returned to virtual capacity but is still not sufficient to meet current demands. Result is that the market remains exceedingly tight and with some users suffering. No overall general improvement is in prospect for the immediate future.

St. Louis—Pig iron continues extremely scarce in this district. Undelivered December allocations were cut off and one large consumer has been cut additionally by OTC. Around 50 per cent of local production is delivered hot to a single rolling mill, and that source was operating at half capacity much of December. Iron shipments from Alabama and Chicago normally serving this district were frequently delayed or reduced. January however is expected to show marked improvement, Koppers United here having completed repairs and obtained sufficient coke for capacity operation. Pig prices still remain substantially under those of scrap, a fact irritating to melters and a new pressure factor on iron.

Seattle—Foundries are facing an acute shortage of materials. Pig iron is practically unobtainable while cast iron scrap is critical. Plants have raised prices from $25.00 to $27.50 gross, fob dealers' yard, and are trying to hold at the higher



Model A 134 Bristol-Rockwell Dilatometer showing application of Alloy 10 Elements in furnace.

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level despite pressure. Inventories are practically exhausted and future operations are uncertain in view of conditions. Demand for foundry goods continues strong.

Semifinished Steel . . .

Carbon steel ingots, blooms, slabs, billets, sheet bars and skelp prices advance

Semifinished Prices, Page 126

Pittsburgh — Carnegie-Illinois Steel Corp. has announced a new Pittsburgh price base on forging quality carbon steel ingots of $40 per gross ton, an increase of $2 a ton. Forging quality and rerolling billets, blooms and slabs have been advanced $3 a ton to $50 and $42, respectively, at Pittsburgh, Chicago and Youngstown. The above prices do not include switching charges of 75 cents a gross ton at Pittsburgh, $1 at Chicago, and 60 cents at Youngstown. Company also has established a new price base on skelp of $2.35 per 100 pounds at Pittsburgh and Youngstown, an increase of $6 a ton. The switching charges on skelp are 5 cents per 100 pounds for carload lots at Pittsburgh and 3 cents at Youngstown.

Prices for rerolling carbon steel ingots have not yet been officially established industrywide, but are said to be well over OPA price ceilings on basis of individual customer negotiations with sales of substantial tonnage reported as high as $55 to $60 per gross ton. Some sales of forging quality ingots in representable tonnages have been made up to as high as $60 a gross ton; rerolling billets, blooms and slags, $42 to $60.

Sheet bar is another item believed to be selling well above OPA price level of $38 per gross ton. Carnegie-Illinois Steel Corp. and Jones & Laughlin Steel Corp. have discontinued accepting new orders for sheet bars, and currently are completing old commitments. Officials of Apollo Steel Co. state Jones & Laughlin and Sharon Steel Corp. will continue to ship the company sheet bars through March, after which Portsmouth Steel Corp. will be their main source of supply. Other sources of supply include Andrews Steel Co., Newport, Ky., and Empire Steel Corp., Mansfield, O. It is reported a number of sheet consumers are buying sheet bars to be further converted into sheets on hand mills located at another plant.

Jones & Laughlin and Sharon Steel Corp. are selling sheet bars under old commitments to Apollo at $50 per gross ton; Portsmouth Steel Corp. at $66 a ton. All quotations are subject to change without notice. It is doubtful that Sharon will continue to furnish sheet bars to Apollo after March 31 in same volume as at present, for this company is in process of rounding out own production facilities to the point where it will have very limited semifinished tonnage to sell on the open market.

Irving Grayson, president, Apollo Industries Inc., has completed negotiations for the purchase of Apollo Steel Co.'s mill at Apollo, Pa. Apollo Industries has acquired 60 per cent interest in the old company and Apollo Mfg. Co., whose stockholders will use the Apollo mill's sheet steel, has bought the other 40 per cent. The mill will be operated for benefit of customer-shareholders under technical management of Portsmouth Steel Corp., Portsmouth, O. The Apollo Industries has leased its share of the steel mill for one year to Apollo Mfg. Co. for an estimated $1.3 million. The names of the customer-shareholders are expected to be made public at next directors meeting to be held Jan. 23.

Carnegie-Illinois also advanced carbon steel tube rounds $7 per ton in size classifications 3 to 8 inches to $64 per gross ton at Pittsburgh and Chicago, excluding switching charges.

Scrap . . .

Scrap Prices, Page 130

Pittsburgh—There were no significant developments in scrap transactions here last week as leading consumers and some foundries remained temporarily out of the market in an effort to stabilize prices. Exorbitantly high cast scrap prices resulted in many foundries attempting to increase proportion of pig iron used in their operations. Price range of No. 1 cupola cast scrap is $32 to $44, compared with No. 2 foundry iron at $30.50. Neville Island, Pa., base price relationship of open-hearth scrap grades and basic pig iron also is out of line. There is little prospect much more tonnage can be

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made available to foundries. It is questionable how long integrated mills can stay out of the market, although most producers report scrap inventories sufficient to sustain present operations for two to three weeks. Mills are receiving some tonnage on previous orders but these shipments are well below daily requirements. Extensive trading for unprepared scrap to be used in exchange for badly needed finished steel has forced unprepared scrap prices up substantially.

Boston — Movement of steelmaking scrap is slower with outside and district consumers showing more resistance to prices. While most melters will not go over $40, delivered, for No. 1 cupola cast, scattered purchases are made at slightly better than $42.

Philadelphia — Heavy melting steel scrap prices are becoming more stabilized, with no important changes recorded during the past few days. Nevertheless, low phos grades are buoyant at $35 to $36, delivered. Electric furnace bundles are quoted $34 to $35 and heavy turnings at $32.50 to $33. Cut structural and plate scrap is moving at $35 to $36, delivered. Leading consumers of foundry scrap are holding generally at their recent offerings of around $41 to $42, delivered, although some scattered tonnages are being placed at considerably higher levels.

New York — Brokers' buying prices on heavy melting steel grades have advanced here to $26 to $26.50, but show signs of leveling off at that range. No. 3 bundles are moving at $24 to $25.50. Electric furnace grades are slightly easier, now holding at $28.50 to $30 for punchings and plate scrap, and $27.50 to $28 for electric furnace bundles. Cut structural and plate scrap are $29 to $30 while No. 1 chemical borings are $26. Cast grades are strong but unchanged.

Detroit — Scrap market last week was marking time, with leading dealers and brokers out of town for the Institute meeting. There is a feeling that the peak of prices may have been reached and an easier tone may develop in the next few weeks in open-hearth and electric furnace grades. Ford is buying electric furnace material at $30.50 per ton. In cast grades, the market continues highly unsettled.

Chicago—With open-hearth scrap continuing to hold firm at $30, the overall scrap market is showing some evidence of becoming stabilized. Flow of material is in fair volume, although still inadequate to meet melting requirements. Lack of scrap plus manpower shortage are combining to hold steelmaking operations down a few points below what otherwise would be possible. Another evidence of market stabilization is the fact that brokers are showing a disposition to make contracts for periods longer than the 30-day period adhered to recently. Foundry demand for scrap continues heavy despite the fact that melting operations are considerably restricted by critical pig iron shortage.

Buffalo—Anticipated increase in scrap shipments after the first of the year so far have not materialized to any appreciable extent. While dealers continue to ship against old orders, no new business was reported. Prices, however, appear to be stabilized around recently-advanced levels. A sale of alloy free turnings has been reported at $23. This compares with a price of $19.50 for ordinary run machine shop turnings and $22 for

straight short shoveling.

Birmingham — Disappointment is expressed in local scrap circles over failure of higher prices to bring scrap out in anticipated quantities. Some easing is evident over the past two weeks, but most sources describe the market as still exceedingly tight, especially in heavy melting and cast grades.

Seattle—Steel scrap advanced $2 to $19.00, effective as of Jan. 2. Supplies are far from adequate but mills hope the higher prices will stimulate shipments. Out of town shipments are priced at $16.50 plus freight. Sellers have inflated ideas in view of the eastern market and local mills have exhausted inventories and are running day-to-day on small receipts. It is reported that eastern interests have made overtures to dealers in this area offering higher prices than are in effect locally. This has further complicated matters for local plants.

Warehouse . . .

Warehouse Prices, Page 128

New York—With revisions in plates and shapes, warehouse price advances in line with increases posted by producers now cover most products but confusion is rampant in applying the numerous extras. Some changes in specifications are appearing to keep clear of impact of extras, both on the part of consumers and warehouse interests. Demand for steel from warehouse is heavy but prospects for early improvement in inventory balance are slight. Held down by quotas and carryovers, most distributors are not covered on all steel wanted and less steel from mills is expected this quarter.

Pittsburgh — Steel distributors have not yet advanced warehouse prices on structural shapes, plain and floor plates, and cold-rolled strip to reflect recent mill advances in base price and extras. Although cold-rolled strip prices were announced some time ago, most distributors have not as yet received applicable extra cards and, therefore, are making deliveries on basis of "open" billings. Prices on the above products are expected to be established this week. Distributors report no let-up in demand and add that unless mill shipments show substantial improvement, distribution of steel from warehouse stocks will have to be continued on a strictly controlled allocation basis through first half at least. Inventories of light gage sheets and small bars and tubular products are particularly low, with stocks of shapes and plates only slightly better.

Philadelphia — Jobbers here, as this issue went to press, were still working to complete their new price schedules. Shape and plate prices had not been set up to conform with the more recent changes in mill base prices and extras, some of which have proved quite sweeping. Also, some distributors had not decided definitely on policy with respect to quoting carbon bars. Various other details in schedules were in the process of being ironed out. Meanwhile, demand is active, with all indications pointing to a heavy volume of business this month from the standpoint of tonnage as well as price

Cincinnati—Warehouses in this district are setting up new price charts, in reflection of recent mill action. Demand is so active that higher prices will be

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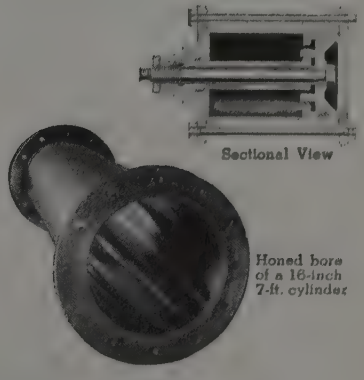

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readily accepted in the trade. Light rounds and structurals are scarce. Sheets are seized eargerly regardless of classification. Mill shipments to some district interests have started to sag, leading some jobbers to anticipate lower volume this quarter.

Metallurgical Coke . . .

Coke By-Product Prices, Page 127

Pittsburgh — By-product foundry coke prices have been advanced $1.50 per ton to $13.75 fob ovens, by Domestic Coke Corp., Fairmount, W. Va. The new price delivered Pittsburgh is $15.61, including increase of 25 cents in freight rate effective Jan. 1. This compares with previous delivered price of $13.86, Pittsburgh.

Portsmouth Steel Corp. also advanced by-product foundry coke to a new price base of $14 a ton, ovens, at Portsmouth, O.; an increase of $1.15. The price at the ovens for shipments to Cincinnati district is $14.25 a ton, a differential which has existed for some time.

Price range for Connellsville beehive foundry coke has been advanced to $9.50 to $10.50 per net ton, compared with OPA ceiling of $9.25 to $9.75. Spot sales of Connellsville beehive furnace coke are reported at $9.50 per net ton; contract prices still unchanged at $8.75.

Little improvement in coke supply is indicated in near future, with most producers expected to continue present policy of allocating limited tonnage available.

New York—By-product foundry coke production is once again at virtual capacity, but there is still a pressing demand for all available tonnage. Meanwhile, district producers advanced prices 95 cents a ton, with the ovens base at Kearney, N. J., now $15.35.

Boston — New England Coke Co. has advanced the price of foundry coke $1.25 a ton to $17.25, delivered within the $3.10 freight rate district which covers most of this territory.

Booklet Showing Uses of Steel Pipe Published

"Pipe in American Life," a 48-page illustrated booklet presenting the historical background and modern uses of pipe, with emphasis on steel pipe, has been published by the Committee on Steel Pipe Research, American Iron & Steel Institute, New York.

Chapters in this interesting booklet are devoted to the uses of steel pipe in homes, large buildings, process industries, railroads, shipping, mining, water supply systems, the oil industry, the gas industry, refrigeration, irrigation and on farms.

Buyers Study Price and Extra Card Revisions

(*Concluded from Page 55*)

pound fob Cleveland, with an added charge of 10 per cent commission and $7.80 a ton for freight. At these prices a ton of sheets would cost over $260. Similar instances are reported elsewhere throughout the country (see STEEL, p, 33, Dec. 23).

Just where this broker steel is coming from is something of a mystery. Some of it is believed to originate in government surplus stocks, but the bulk is thought to be coming out of manufacturing plants which have future commitments on mill books and are not in immediate need of large inventory, or have changed requirements. The steel producers deny any of it is coming from their plants, and insist they are not trading finished steel for scrap as is charged in some quarters. Also, the charge has been heard that some mills have produced ingot from scrap for dealers on a conversion basis, getting an additional conversion charge for rolling the ingot into sheets. This charge, however, also lacks confirmation and is categorically denied by the mills.

So far as can be learned few consumers are taking any of this high-priced broker steel, and, for that matter, the total tonnage held by such sellers is not believed large enough to materially affect the overall market.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

5000 tons, gas holder, Glenwood Landing, Long Island, for the Long Island Lighting Co., to Bethlehem Steel Co., Bethlehem, Pa.

2100 tons, 19-story apartment, Uris Brothers, Fifth Ave. and 59th St., New York, to Harris Structural Steel Co., New York.

770 tons, apartment, Grand Concourse, Bronx, New York City, to Grand Iron Works, New York.

700 tons, building, Grand City Container Co., North Bergen, N. J., through S. S. Silverblatt, general contractor, to Schacht Steel Construction Inc., New York.

700 tons, ventilator building, Brooklyn-Battery tunnel, through Joseph Weinstein, general contractor, to Bethlehem Steel Co., Bethlehem, Pa.

640 tons, factory building, Chicago, for Edith Building Corp., to Wendnagel & Co., Chicago.

500 tons, apartment, 314 West 76th Street, Manhattan, to Grand Iron Works, New York City.

393 tons, sheet piling, 59th St. harbor improvement, Chicago, for Chicago Park Board, to Carnegie-Illinois Steel Corp., Chicago; Harry A Thompson, Chicago, contractor; bids Dec. 16.

200 tons, paper mill addition, Camas, Wash., to Pacific Car & Foundry Co., Seattle.

150 tons, storage building, Rockford, Ill., for Greenlee Bros. & Co., to Mississippi Valley Structural Steel Co., Decatur, Ill.; Security Building Co., Rockford, Ill., contractor.

STRUCTURAL STEEL PENDING

1000 to 1500 tons, rehabilitation blast furnace No. 1, Indiana Harbor, Ind., for Youngstown Sheet & Tube Co.; Arthur G. McKee & Co., Cleveland, engineer-contractor.

1000 tons, state bridge, Northport, Wash., bids about Apr. 1; sole bid of $323,849 rejected account of cost and delivery.

900 tons, extension of sludge disposal building, Division Qb, West-Southwest sewage treat-

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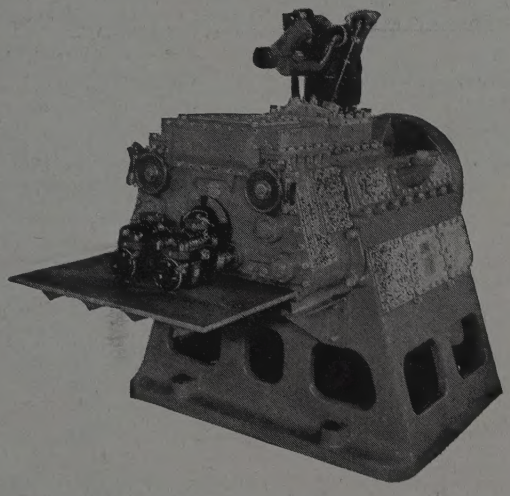

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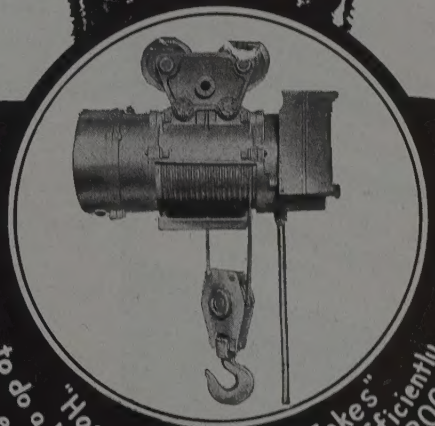

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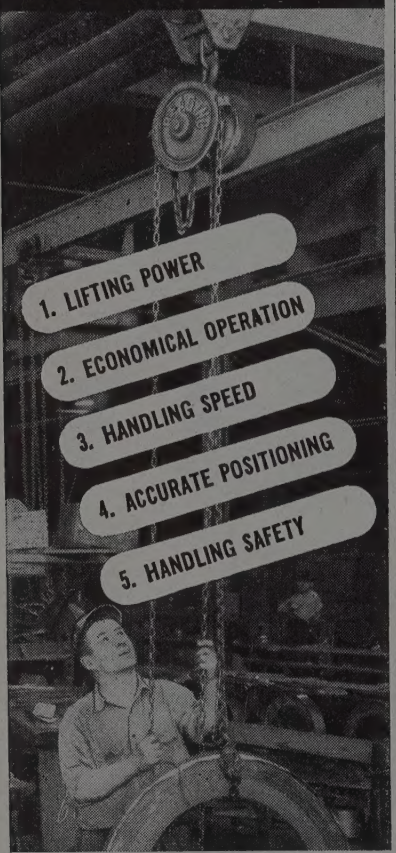

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ment works, Chicago, for Sanitary District of Chicago; bids Jan. 9.

400 tons, diesel locomotive shop for Pennsylvania railroad, Altoona, Pa.

300 tons, research and office building, Du Pont interests, Waynesboro, Va.

185 tons, bridge, Sec. 3F, Marshall county, Ill., for State Highways Division; bids Jan. 10.

120 tons, bridge, Sec. 43F, Pike county, Ill., for State Highways Division; bids Jan. 10; bids taken Nov. 15 rejected.

REINFORCING BARS . . .

REINFORCING BARS PLACED

100 tons, plant addition, Washington Co-op Egg Co., Seattle, to Bethlehem Pacific Steel Co., Seattle.

Unstated, $2½ million newspaper plant, Post-Intelligencer, Seattle; general contract to H. S. Wright Co., Seattle.

Unstated, two girder bridges and overpass, Yakima county, Washington; general contract to Rumsey & Co., Seattle, low, $214,875.

REINFORCING BARS PENDING

110 tons, Washington state highway projects; bids to Olympia, Jan. 14.

Unstated, $9 million building program, University of Washington, Seattle; approved by CPA.

Unstated, $3 million building program, Washington State College, Pullman, Wash.; bids to Spokane, Feb. 7.

Unstated, four-lane concrete deck, city of Seattle; plans in preparation.

PLATES . . .

PLATES PENDING

Unstated, water system, Dry Falls Lake, Coulee, Wash.; Rushlight Automatic Sprinkler Co., Portland, Oreg., low, $358,213.

Unstated, Bow Lake airport, water system, Seattle; $600,000 available for 48-inch pipe line; bids soon.

Unstated, 31,000 ft., 14-in. steel pipe, Cottage Grove, Oreg., bids in.

PIPE . . .

STEEL PIPE PLACED

2500 tons, 24-inch steel pipe, Westchester Lighting Co., Westchester county, to Bethlehem Steel Co., Bethlehem, Pa.

225 tons, 72-inch water pipe, Spec. 1534, Ft. Collins, Colo., for Bureau of Reclamation, Denver, to Provo Foundry & Machine Co., Provo, Utah; bids to Denver Dec. 17.

CAST IRON PIPE PLACED

450 tons, 4 to 12-in., Bremerton, Wash., to H. G. Purcell, Seattle, for U. S. Pipe & Foundry Co., Burlington, N. J.

CAST IRON PIPE PENDING

200 tons, Seattle, local project; general bids in.

156 tons, Bellington, Wash.; bids Jan. 9.

150 tons, Yakima, Wash.; bids Jan. 15.

RAILS, CARS . . .

RAILROAD CARS PLACED

New York, New Haven & Hartford, 500 fifty-ton box cars, to Pullman Standard Car Mfg. Co., Chicago.

RAILROAD CARS PENDING

Seaboard Air Line, 500 box cars and 175 phosphate cars.

Southern Pacific, 5200 freight cars, comprising 3000 fifty-ton box cars, 1500 composite drop-bottom general service gondolas, 500 composite type bottom gondolas, 100 seventy-ton hoppers, 100 seventy-ton type bottom gondolas.

CONSTRUCTION AND ENTERPRISE

CALIFORNIA

LONG BEACH, CALIF.—Hayward Pipe & Supply Co. has been formed by Archie L. Tower, Suite 715, Farmers & Merchants Bank Bldg., with $25,000 capital.

LOS ANGELES—Vermont Tool & Supply Co., 2431 Santa Fe Ave., has obtained CPA approval for construction of a one-story, 60 x 120-foot parts factory at Washington Blvd. and Santa Fe Ave., to cost $17,500.

LOS ANGELES—Sierra Drawn Steel Co., 5731 Randolph St., Bell Gardens, has received a building permit for construction of a building addition, to cost $10,000.

LOS ANGELES—Union Hardware & Metal Co., 411 E. First St., has awarded contract for four-story, 100 x 250-foot warehouse, to cost over $500,000, to Pozzo Construction Co., 2403 Riverside Dr.

LOS ANGELES—Minneapolis Mining & Mfg. Co., 900 Farquier Ave., St. Paul, plans construction of one-story rubber cement plant and one-story, 50 x 100 mixing plant, Garfield Ave. and Randolph St., to cost $130,000.

SALINAS, CALIF.—International Minerals & Chemical Corp., Box 647, San Jose, Calif., and Spreckels Sugar Co., 2 Pine St., San Francisco, have awarded contract for plant alterations including boiler plant, steam generator, etc., and new equipment to Herrick Iron Works, 18th and Campbell Sts., Oakland, Calif., for an estimated $600,000.

VERNON, CALIF.—American Manganese Steel Co., 5803 Downey Rd., plans construction of a factory and warehouse addition, to cost $32,000.

VERNON, CALIF.—National Lead Co., 932 Wilson St., Los Angeles, plans construction of three-story paint factory, one-story office, and one-story warehouse, 3107 E. 26th St., to cost $482,000.

ILLINOIS

CHICAGO—Kent Products. 222 W. Monroe St., has awarded contract for one-story factory to S. O. Strandberg Co., 134 S. La Salle St., for an estimated $200,000. Sidney Finck, 134 N. LaSalle St., architect.

VENICE, ILL.—Union Electric Co. of Missouri, J. W. McAfee, president, Union Electric Bldg., St. Louis, plans construction of steam power generating plant, to cost $10 million.

INDIANA

ANDERSON, IND.—Nicholson File Co., 34th and Lynn Sts., will soon let contract for power plant to cost $75,000 or more.

MICHIGAN

BASE LINE, MICH.—Rex-O Mfg. Co., 11393 E. Eight Mile Rd., has been formed with $100,000 capital to engage in a general manufacturing business, by Rudolph R. Otto, 12225 Promenade Ave., Detroit.

CHEBOYGAN, MICH.—Straits Steel & Wire Co., Western and Taylor Aves., has been formed with $50,000 capital to fabricate wire and metal products, by T. Chalmers Curtis, Petoskey, Mich.

DETROIT—Lincoln Trading Corp., 3605 Barlum Tower, has been organized with $50,000 capital to manufacture and sell ferrous and nonferrous materials, by Evelyn Kaake, 3016 Rochester Ave.

DETROIT—Avery Mfg. Co., 6615 E. Jefferson Ave., has been formed with $50,000 capital to conduct a general manufacturing business, by B. H. Thomas, 3156 Penobscot Bldg.

DETROIT—Detroit Metal Cutting Co., 5217 Woodbridge Ave., has been organized with $50,000 capital to cut and shear metal, wood

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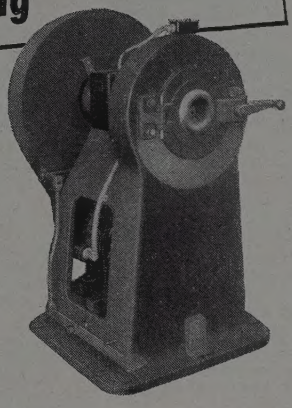

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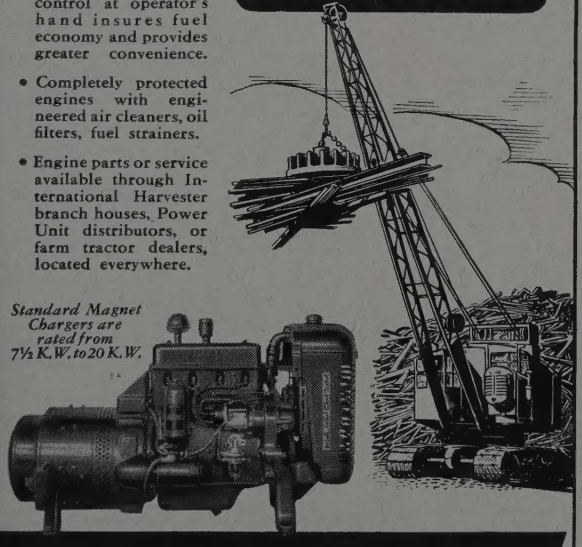
- Self-starting. Remote control at operator's hand insures fuel economy and provides greater convenience.
- Completely protected engines with engineered air cleaners, oil filters, fuel strainers.
- Engine parts or service available through International Harvester branch houses, Power Unit distributors, or farm tractor dealers, located everywhere.



Standard Magnet Chargers are rated from 7½ K.W. to 20 K.W.

THE READY-POWER CO.
11230 Freud Ave. • Detroit 14, Mich., U.S.A.

FOR THE *Best* SOLDERING JOB USE THE *Best* FLUX

KESTER FLUXES

Photo courtesy General Electric X-Ray Corporation

● The best flux for any soldering job is the right flux. And Kester has the right flux for you.

● Nearly half a century of solder experience has resulted in the development by Kester of hundreds of flux formulas. Extensive testing—both in the laboratory and in the plant—provides Kester with complete knowledge of the performance of each flux. The circumstances under which each flux may best be used have been accurately determined.

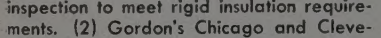
● Sweating operations—delicate dip-soldered electrical connections—all kinds of seaming—for any type of soldering job, there's a right and specific Kester flux to assure you of tight, trouble-free solder bonds.

● Consult Kester engineers whenever you have solder problems. At no obligation to you, they'll gladly recommend the right flux formula to insure the best results from any operation.

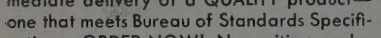
KESTER SOLDER COMPANY
4222 Wrightwood Avenue, Chicago 39, Ill.
Eastern Plant: Newark, N. J.
Canadian Plant: Brantford, Ont.

KESTER *Solder Fluxes*
STANDARD FOR INDUSTRY

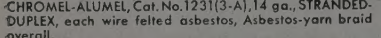
There are two good reasons why we stress Gordon Quality and Gordon Service. (1) The precision quality of Gordon Thermocouple Extension Lead Wire is based upon 32 years of experience in careful selection and inspection to meet rigid insulation requirements. (2) Gordon's Chicago and Cleveland plants carry complete stocks of Thermocouple Extension Lead Wire for practically every application. (See illustrations below.) This means that your order gets immediate delivery of a QUALITY product—one that meets Bureau of Standards Specifications. ORDER NOW! No waiting or delay. Prices available upon request.



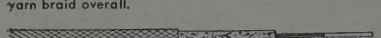
CHROMEL-ALUMEL, Cat. No. 1231(3-A), 14 ga., STRANDED-DUPLEX, each wire felted asbestos, Asbestos-yarn braid overall.



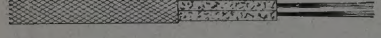
FOR PLATINUM THERMOCOUPLES, Cat. No. 1225, 16 ga., STRANDED-DUPLEX, each wire felted asbestos, Asbestos-yarn braid overall.



CHROMEL-ALUMEL, Cat. No. 1234, 14 ga., SOLID-DUPLEX, each wire enamel, felted asbestos, Asbestos-yarn braid overall.



IRON-CONSTANTAN, Cat. No. 1236-C, 14 ga., STRANDED-DUPLEX, each wire felted asbestos, Asbestos-yarn braid overall.



COPPER-CONSTANTAN, Cat. No. 1235-A, 14 ga., SOLID-DUPLEX, each wire cotton, rubber, weatherproof braid, lead sheath overall.

GORDON SERVICE

CLAUD S. GORDON CO.

Specialists for 32 Years in the Heat Treating and Temperature Control Field

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and plastic products, by D. A. Metcalf, 4164 Guilford Ave.

DETROIT—LeRoy Fabricating Co., 12160 Cloverdale Ave., has been formed with 100,000 shares of no par value stock to fabricate and erect steel, by Maurice Dreifuss, 1619 Dime Bldg.

DETROIT—Perma Steel Products Co., 13551 Auburn Ave., has been organized with $50,000 capital to manufacture mechanical appliances, by Leonard Friedman, 19943 Roslyn Rd.

EAST DETROIT, MICH.—Glenfield Machine & Tool Corp., 21940 Groesbeck Highway, has been formed with $500,000 capital to manufacture machinery, tools, dies and implements, by Peter McCall, 888 Drexel Ave., Detroit.

DETROIT—National Gear & Sprocket Inc., 2024 Dime Bldg., has been organized with $100,000 capital to manufacture gears, sprockets and allied machine products, by E. C. Smally same address.

MIDLAND, MICH.—City has awarded an $82,000 contract for construction and installation of 500,000 gal elevated water storage tank to Pittsburgh-Des Moines Steel Co., Chicago.

VICKSBURG, MICH. — Viking Products Co. has been organized with $50,000 capital to conduct a general manufacturing business, by Fred H. Johnson, 21 Elm Park, Pleasant Ridge, Mich.

MISSOURI

BRENTWOOD, MO.—Hanroad Inc. has received CPA approval for addition to sheet metal shop, to cost $44,219.

DE SOTO, MO.—Missouri Pacific Railroad, R. P. Hart, chief engineer, Missouri Pacific Bldg., St. Louis, has awarded contract to own forces for 100 x 700-foot car fabricating plant and 200-foot craneway addition.

KANSAS CITY, MO.—Mid-West Research Institute, c/o G. E. Ziegler, 4449 Pennsylvania St., has had plans prepared by Wight & Wight, First National Bank Bldg., for research laboratory, to cost $1 million.

NEW JERSEY

CAMDEN, N. J. —Stonecrete Corp., 509 Market St., has awarded contract for manufacturing building, warehouse and office building to Constanze Contracting Corp., 5328 Sherwood Terrace, Merchantville, N. J., for $100,000. Radey & MacNelly, 101 N. Seventh St., architects.

HAMILTON TWP., N. J. — Sloane Blabon Corp., Bear Swamp Rd., Trenton, N. J., has awarded contract for design and construction of manufacturing, office and plastic buildings to W. Kidde Constructors Inc., 140 Cedar St., New York, for an estimated $1,373,000.

NORTH BERGEN, N. J.—Grand City Container Corp., 622 W. 57th St., New York, has awarded general contract for factory, Tonnelle Ave., to S. S. Silberblatt Inc., 25 W. 45th St., New York, for an estimated $2 million. S. Brian Baylinson, 26 W. 58th St., New York, consulting architect.

ROEBLING, N. J.—J. A. Roebling & Sons Co., 640 S. Broad St., Trenton, N. J., has awarded contract for power plant to Rust Engineering Co., Clark Bldg., Pittsburgh, for $1,500,000.

NEW YORK

LONG ISLAND CITY, N. Y.—Philip Sievering Inc., 199 Lafayette St., New York, has had plans completed by Harold Austin, c/o owner, for one-story factory, Hunters Point Ave. and Van Dam St., to cost $275,000.

NEW YORK—Triborough Bridge & Tunnel Authority, Engineer's Office Bldg., 10 State St., New York, has received a low bid of $900,012 for electrical switchboards and panels and equipment for Brooklyn-Battery Tunnel from General Electric Co., River Rd., Schenectady, N. Y.

OHIO

AKRON — D-S-C Industries Inc. has been organized with $100,000 capital to manufacture automotive pistons, by Charles H. Davis, Carl F. Cranz and Forrest E. Smith, RFD No. 7, Box 200.

ALLIANCE, O.—Kulka Iron & Metal Co., 826 N. Webb Rd., formerly a partnership, has been incorporated with $200,000 capital and has changed its name to Kulka Steel & Equipment Co. Incorporators were Belle, James M. and L. P. Kulka.

BARBERTON, O.—Babcock & Wilcox Co., Shirwood Ave., plans construction of building to cost $88,680 to house x-ray equipment.

CLEVELAND—Aluminum Solder Co. has been organized with $20.000 capital to manufacture aluminum solder. H. W. Boonen is president and Harold E. Eckes, 3269 Avalon Rd., Shaker Heights, O., chairman, of the new company.

OKLAHOMA

HARRAH, OKLA.—Oklahoma Gas & Electric Co., 321 N. Harvey St., Oklahoma City, Okla., has plans 75 per cent completed for 12,500 kw steam turbogenerator unit in Horse Shoe power plant near here, to cost $1 million.

PONCA CITY, OKLA.—Oklahoma Gas & Electric Co., 321 N. Harvey St., Oklahoma City, Okla., has plans 60 per cent completed for 20,000 kw steam turbogenerator unit in Beerbower power plant near here, to cost $1,500,000.

OREGON

SALEM, OREG.—Keith-Brown Co., 1450 Tile St., plans $100,000 expansion program involving construction of resaw mill, auxiliary building for machinery, two kilns, steam boiler plant, dust collecting system and 90-ft overhead traveling crane.

PENNSYLVANIA

PITTSBURGH—E. H. Rousseau, 2101 Broadhead Fording Rd., has awarded contract for one story, 200 x 300-foot factory, to cost $80,000, to own forces. S. L. R. Rousseau, Arrott Bldg., architect.

PITTSBURGH—Crucible Steel Co. of America, Oliver Bldg., has awarded contract for remodeling three mill buildings to H. H. Robertson Co., Farmers Bank Bldg., for $60,000; for constructing one-story, 75 x 75 x 52-foot and one-story, 75 x 51 x 17-foot mill building additions costing $87,000 separate contracts have been awarded.

SCRANTON, PA. — Scranton-Lackawanna Industrial Bldg. Co. and Lennox Furnace Co. have plans under way for industrial building on Corey St., to cost $450,000.

SOUDERTON, PA. — Paulsboro Mfg. Co., 1700 Walnut St., Philadelphia, has rejected bids for 210 x 300-foot warehouse and office building to have cost $400,000. The company will readvertise. Ballinger Co., 105 S. 12th St., Philadelphia, architect.

TEXAS

ATHENS, TEX.—Harbison-Walker Refractories Co. has abandoned project for plant addition, to have cost $90,000.

BAYTOWN, TEX. — General Tire & Rubber Co. has awarded contract to Tellepsen Construction Co., 3900 Clay Ave., Houston, Tex., at $242,682, for construction of additions and alterations to carbon black plant. Lockwood & Andrews, Union National Bank Bldg., Houston, engineers.

CORPUS CHRISTI, TEX.—Tex-Mex Cement Co., Cedric Willson, operating vice president, and Erle P. Halliburton, Ducan, Okla., have selected a 65-acre tract on the ship channel which will be used as a site for a cement plant, to cost approximately $5 million. Svedrup & Councel, St. Louis, and Bartholomew & Debruin, 500 Stuart St., Houston, Tex., architects, expect to have plans completed by about Mar. 1.

WASHINGTON

SEATTLE—Washington Iron Works, 1500 Sixth Ave. S., has had plans prepared by Lamont & Fey for $15,000 plant addition.